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HOUSE OF LORDS

SESSION 1993—94

3RD REPORT

SELECT COMMITTEE ON
SCIENCE AND TECHNOLOGY

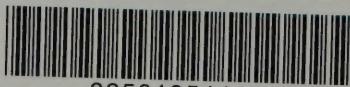
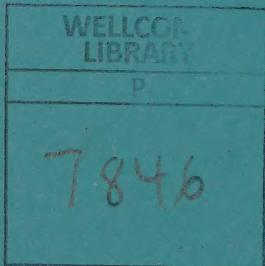
DEFENCE RESEARCH AGENCY

REPORT

Ordered to be printed 7 July 1994

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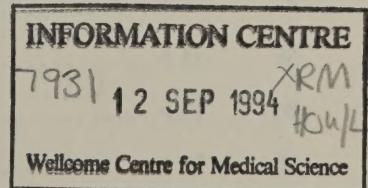
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THIRD REPORT

7 July 1994

By the Select Committee appointed to consider Science and Technology.

ORDERED TO REPORT

DEFENCE RESEARCH AGENCY

PREFACE

The Committee has conducted an enquiry into the Defence Research Agency¹.

The Committee appointed as its specialist advisers Professor Frank Hartley, CChem FRSC, Vice-Chancellor of Cranfield University, and Professor Philip Gummell, Professor of Government and Technology Policy at the University of Manchester.

The Committee thanks those witnesses who gave evidence, both written and oral, to their enquiry. All are listed in Appendix 2. This evidence is published in the volume which accompanies this report, although certain diagrams and annexes enclosed in evidence are not printed and can be inspected in the House of Lords Record Office; references to page numbers and question numbers correspond with those in that volume. The Call for Evidence is printed in Appendix 3.

In December 1993 the Committee visited the Defence Research Agency's sites at Alverstoke, Haslar and Malvern. The Committee is grateful to all those at the sites who so kindly received them, and especially thank those staff whose preparation in advance made the visits so worthwhile. In addition, we would like to extend special gratitude to the DRA Company Secretary, Mrs Elizabeth Peace, for her tireless efforts to assist the enquiry.

Throughout the report the terms "DRA" and "the Agency" refer to the Defence Research Agency. All other acronyms to be found in the report are defined in Appendix 4.

Occasional mention is made in the report of the 1993 Framework Document, under which the DRA operates. For easy reference, this document is reprinted as Appendix 5.

¹ The Members of the Sub-Committee which conducted the enquiry are listed in Appendix 1.

CHAPTER 1 INTRODUCTION

1.1 The Defence Research Agency (DRA) was set up in April 1991 as a wholly owned agency of the Ministry of Defence (MoD). It was formed as the amalgamation of four research establishments: the Royal Signals and Radar Establishment (RSRE); the Admiralty Research Establishment (ARE); the Royal Aerospace Establishment (RAE); and the Royal Armament Research and Development Establishment (RARDE). All of these establishments were themselves consolidations of numerous smaller establishments. The Agency is one of Britain's largest employers of qualified scientists and engineers¹, with a turnover in 1992-93 of £795.8 million and operating profits of £39.4 million², and its role is principally to provide to MoD:

- long term (strategic) research in support of defence;
- applied research in support of perceived defence needs;
- research and development (R&D) in support of the equipment procurement programme;
- technical advice to MoD's Procurement Executive (PE) in support of the procurement programme;
- support of in-service equipment and its modification both in peace and in conflict; and
- a pool of technically qualified staff to work in MoD in general and in the Procurement Executive in particular, and to ensure that both are intelligent customers in the procurement process.

It also undertakes a smaller amount of work for other Government Departments (OGDs) and industry; in 1992-93 this work accounted for 9 per cent of DRA's income.

1.2 DRA does not undertake all of MoD's research and development. Nuclear, biological and chemical (NBC) research is undertaken by separate establishments³, as is research in a few smaller areas such as operational analysis (OA)⁴ and stores and clothing⁵. A large proportion of the defence research and development that is paid for by MoD is contracted out to industry, with 40 per cent of the MoD's £580 million research programme and a higher proportion of the £1,750 million development programme being conducted extramurally in 1992-93⁶. DRA itself spends considerable sums extramurally: in 1992-93 the Agency spent £188.1 million on extramural research costs, with a further £104.7 million going towards direct materials and services⁷.

1.3 The United Kingdom has historically placed a great emphasis on its armed forces being able to exploit the leading edge technology of the day, and the research establishments out of which the DRA was eventually formed were set up to give our forces this edge. In the years since the Second World War, the defence research and development establishments built up a reputation as being among the best of their kind in the world, a view which was attested to in much of the evidence submitted to the Committee. By providing superior technological back-up and know-how,

¹ A breakdown of DRA's 5,000 qualified scientists and engineers by specialisation is provided in the statistical analysis printed in Appendix 6. This appendix also includes breakdowns of DRA's income sources, staff location and expenditure.

² DRA Report and Accounts for 1992-93, p 46.

³ Respectively undertaken primarily by the Atomic Weapons Establishment (AWE) at Aldermaston, near Newbury, Berkshire; and by the Chemical and Biological Defence Establishment (CBDE) at Porton Down, near Salisbury, Wiltshire.

⁴ Undertaken by the Defence Operational Analysis Centre (DOAC) at West Byfleet in Surrey.

⁵ Undertaken by the Stores and Clothing Research and Development Establishment (SCRDE) at Colchester in Essex.

⁶ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraphs 7 and 26.

⁷ DRA Report and Accounts, 1992-93, p 50.

they contributed much towards maintaining the United Kingdom's position as a power whose military strength was greater than that of several countries with larger forces. However, the contribution of these establishments to the nation was noticeable also in their industrial expertise: several technologies were first developed for military use by them, and among these can be cited liquid crystal displays (LCDs) and thermal imaging. The RSRE, which is now DRA Malvern, alone collected 13 Queen's Awards for Technological Innovation between 1979 and 1992, and DRA Farnborough this year won a Queen's Award for its development of advanced composite main rotor blades for the Lynx helicopter. DRA has stated that the continuance of this excellence is its top priority, and aims "to be the government owned research and technology organisation that is most commonly quoted as the benchmark in all Western nations for responsiveness, efficiency and standard of work and thus be a source of pride to our owners, our customers and our staff".¹ We consider that, in the light of the ability of the management and staff at DRA which was so apparent to us throughout the enquiry and especially during our visits, this aim is one which can be achieved.

1.4 With the end of the Cold War, defence departments' budgets in Western nations have come under increased pressure, and are consequently allocated proportionately less Government funding. However, as is noted in the Statement on the Defence Estimates 1994,

"The need to retain battle-winning technological advantage is as pressing now as it has ever been in the context of changing, unpredictable risks."²

This advantage must now be upheld on smaller funds, and it is against this background that DRA was set up. The aim was to turn MoD's non-NBC research establishments into a more responsive and commercially orientated business selling its services to MoD, which at the time of DRA's establishment provided over 90 per cent of its income, and to its other customers such as OGDs and industry. Trading Fund status — that is, independence from the Consolidated Fund — was granted to DRA in April 1993, with the aim of improving the Agency's competitiveness, efficiency and value for money: the Agency is now required to operate on a commercial basis with predetermined performance targets, and is financed by income earned from its customers. Over the next few years, a greater proportion of the funds spent with or through DRA will be exposed to competition, and MoD intends to subject the work which DRA carries out for the Procurement Executive progressively to competition, with the aim of achieving 100 per cent within four years of the granting of Trading Fund Status.

1.5 To achieve greater competitiveness against the background of a programmed fall in income from MoD of 15 per cent between 1993 and 1996³, DRA is undergoing a programme of cost-cutting, involving a rationalisation of its sites, a restructuring of support activities and a market testing programme. 18 of its 54 sites (which are mostly in the South of England⁴) will be closed, and DRA's total workforce will be reduced by 2,000 (from a pre-DRA figure of 11,400) by a mixture of voluntary and compulsory redundancies. An investment of £220 million (excluding redundancy payments) is expected to be completed by mid-1996, with the aim of saving £90 million annually by 1997-98.

1.6 In addition DRA expects to make more positive thrusts into the commercial world by developing greater alignment with industry through its Pathfinder programme, Strategic Alignment initiative and Dual Use Technology Centres (DUTCs)⁵. In doing so, it hopes to contribute to national prosperity in line with the statement by the Ministry of Defence that the Ministry recognise that their research programme 'has a role to play in increasing national prosperity and improving

¹ DRA Corporate Plan 1994-1999.

² *Statement on the Defence Estimates 1994* (Cm 2550), paragraph 435.1.

³ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 9.

⁴ For an analysis of DRA staff by location, see Appendix 6.

⁵ These terms are described further in paragraphs 3.7, 3.9 and 3.12 respectively.

the quality of life"¹. Furthermore it is expected that there will be greater exploitation of intellectual property rights (IPR) from DRA programmes. DRA's new programmes and the issues surrounding IPR will be expanded in Chapter 3.

1.7 DRA operates under the arrangements defined in the Framework Document of April 1993². A full review of this document will be undertaken jointly by the Secretary of State for Defence, the Chief Executive of DRA, the Treasury and the Office of Public Service and Science (OPSS) after five years; an interim review will take place next year.

1.8 DRA is answerable to the Secretary of State for Defence, who devolves his responsibilities in this regard to the Minister of State for Defence Procurement. The Minister invited the Committee to recommend changes to the 1993 Framework Document for his consideration during the interim review (Q 841). While the Committee will not in this report propose specific amendments to the Framework Document, we hope that our recommendations will be reflected in any changes made to the Document next year.

1.9 The report is divided into three sections plus a summary of conclusions. The three sections are:

- The Defence Research Agency and Government (Chapter 2);
- The Defence Research Agency and Industry (Chapter 3); and
- The Defence Research Agency and Science (Chapter 4).

It should be stressed that the sections are so arranged for purposes of convenience only. Government, industry and science are interdependent and there is therefore overlap between all three sections of the report.

¹ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 8.

² See Appendix 5.

CHAPTER 2 THE DEFENCE RESEARCH AGENCY AND GOVERNMENT

2.1 In the past, the research establishments out of which DRA was formed were answerable to the Secretary of State for Defence, and the intention of the present Government is to maintain DRA as a wholly owned agency of MoD. Against the background of the fact that DRA depends on MoD sources for over 90 per cent of its income and consumes about half of MoD's £580 million¹ research budget, continued MoD ownership of DRA appears to be logical. However, much of the evidence submitted to the Committee notes the possibility, or the desirability, of a future re-examination of the relationship between DRA and MoD.

2.2 In evidence to the Committee, one of the recurring themes was that the current relationship between DRA and MoD restricted the ability of the agency to perform one of the objectives of the 1993 Science White Paper², that of making a greater contribution to the wealth creating ability of the nation. Several suggestions were made as to how this situation could be remedied, ranging from urging MoD to take a greater interest in wealth creation to the widening or reorientation of the role of DRA along the lines of the Advanced Research Projects Agency (ARPA)³ which operates in the United States of America⁴. No support was given to partial or outright privatisation of DRA⁵, and the Minister of State for Defence Procurement argued that, among other reasons for being cautious about privatisation,

“the Defence Research Agency does share with our allies a certain amount of secret research. I think that some of our allies would be anxious if they thought that that secret area of research was moving into the privatised private sector as opposed to being under the control of government” (Q 861).

Some witnesses, however, felt that it was right to place the research establishments under greater commercial pressure. Mr Keith Henry of Brown and Root Ltd stated that “There is no doubt that the Trading Fund status and the commercial awareness that the DRA Executive has introduced has led to a substantial improvement in service and quality” (p 276). While some witnesses called for changes to be made to the Agency’s operation and constitution, there was a widely held view that a period of stability was essential for DRA if it were to establish a successful *modus operandi*. Sir Ronald Oxburgh (until 1993 Chief Scientific Adviser (CSA) at MoD) believed that “the DRA should be allowed to operate under the present arrangements for a further period of at least five years to allow the full effect of recent changes to become clear” (p 162).

2.3 It is appropriate at this point to examine the relationship between DRA and MoD and to take note of DRA’s role. Research, despite its name, is only one of its two main functions. The other — and according to Sir Ronald Oxburgh possibly the more important — is

“technical advice which draws on the broad base of military technical expertise that research activity sustains within the Agency, whether the issue is to recognise threats presented by new weapons or by new technologies, or in an emergency to propose counters to new weapons or new tactics, or dozens of other applications” (pp 157-158).

To that end it engages in three areas: strategic research (long term research in areas with potential defence applications), applied research (shorter term research directed towards a specific practical aim or objective) and project support.

¹ Figure for 1992-93. This excludes MoD’s development programme, which in the same year totalled £1,750 million, spent largely through private industry.

² *Realising our Potential*, Cm 2250.

³ Formerly the Defence Advanced Research Projects Agency (DARPA).

⁴ See Appendix 8.

⁵ However, evidence was given, for example by Sir Peter Kemp (pp 283-284), that prior to the setting up of DRA privatisation was considered by some to be a viable proposition for defence research establishments.

2.4 Although the Office of Science and Technology (OST) has stated (p 194) that paragraph 2.2 of the Framework Document gives the DRA a secondary mandate for wealth creation, the Agency has no obligation to serve anyone or anything other than the Secretary of State for Defence. Furthermore, paragraph 6.6 of the Framework Document states that

“In entering into agreements with bodies other than MoD to provide research or technical support, DRA will have regard to its obligations to provide an independent scientific and technical service to MoD and will not prejudice those obligations, even if this should be to its financial disadvantage”.

This position means that there is very little confusion as to DRA's objectives: MoD customers order technologies or advice and DRA delivers where it can; where it has excess capacity, DRA may serve the needs of other customers, be they OGDs or other public and private bodies. However, evidence to the Committee has suggested that a case could be made for rebuilding DRA's relationships with MoD and other Government Departments so as to allow for less dependence by DRA on defence and to facilitate the transfer of technology between DRA, industry and the wider science base¹.

DRA AND THE MINISTRY OF DEFENCE

2.5 While the ownership of the defence research establishments has not changed since the inception of the new arrangements, the relationship between DRA and MoD has². Under the old system, the Establishments were allocated funds and were relatively free to set their own research priorities³; now, funding is channelled through MoD customers (see Appendix 7), who commission research and other services from the Agency, with the result that DRA's capacity to set its own research priorities has been reduced. This creates the paradoxical situation of an Agency which is ostensibly more independent than its predecessors yet which is in reality under tighter control from above, and under the 1993 Framework Document this situation is likely to remain unless DRA substantially increases the amount of work which it undertakes for customers outside MoD. However, even if DRA succeeds in its aim of doubling its non-MoD business base from some £50 million in 1993-94 to £100 million by 1998-1999, non-MoD work will still account for only 15 per cent of turnover⁴. The Agency is expected by its owner to act commercially in that, for example, it is expected to bid for MoD research contracts and to earn a return of 6 per cent on capital invested. However, there are limits upon its freedom to enter into commercial activities. For example, it is inhibited from investing in areas not deemed suitable by MoD and cannot close down without reference to MoD certain loss-making facilities belonging to the Agency (such as wind tunnels or ship tanks). The independence of DRA is, in practice, heavily constrained.

2.6 Of course, in a normal commercial situation where a concern is wholly owned by one party, it is right that the owner should call the shots. Yet such a policy may effectively damage the potential of DRA to contribute to the wealth creating ability of the nation. DRA holds much expertise in areas valuable outside the field of defence or in areas relevant not just to MoD, but also to civil government and industry. It is claimed that MoD has “no mandate” (p 263) to contribute to the health of British industry, except to maintain a sufficient supplier base. The reference to MoD in this year's *Forward Look* is of interest here:

“Although the prime purpose of the non-nuclear Defence research programme is to enhance Defence capability, the Ministry of Defence recognises that its research

¹ See p 69, p 58, Q 605, and Q 436.

² Though this is to some extent due to the introduction of the Package Management system as well as the DRA Trading Fund; it is a coincidence that both developments occurred simultaneously.

³ As is still often the case elsewhere. Evidence from the Royal Academy of Engineering notes that of the 7 national government aerospace research establishments in Europe, DRA is “unique in being required to generate all its income from contracts (or quasi-contracts) covering specific items of work. The others typically receive a ‘base grant’ of typically 30 per cent of total income as an aid to stability and continuity, and to provide some scope for ‘private venture’ work in advance of customer demand” (p 138).

⁴ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 10.

programme also has a role to play in increasing national prosperity and improving the quality of life. To some extent this wealth creation results directly from research and development effort feeding through into equipment production programmes in the United Kingdom Defence industrial sector, which then lead to export orders that contribute to national income. For example, over the 5 years from 1987-1991, the United Kingdom won an average of £3.86 bn of new export orders and took 13 per cent of the world Defence export market. In 1991, despite a declining world market, the United Kingdom still won orders of £3.5 bn and increased its market share to 17 per cent. Expenditure on Defence research can, however, lead to technological advances that benefit civil industry, although it is very often the case that considerable further development expenditure is necessary to turn a military research idea into a profitable civil product.¹¹

This may appear to suggest that MoD is content with its contribution to the British defence industry.

2.7 However, MoD has stated that "It is a gross canard to say that the Ministry of Defence has no interest in the state of its industrial or supplier base. We are restrained for resources" (Q 53) and that "We cannot afford to spend money on things which do not clearly benefit the defence efforts of this country" (Q 54).

MoD and DRA's customer-contractor relationship

2.8 The language used to describe the new arrangement between MoD and DRA is that of customer and contractor. However, it is important to recall that paragraph 6.1 of the Framework Document describes the Secretary of State as "both the owner of the DRA and its principal customer". MoD has therefore to consider its responsibilities under both headings, and to strike the right balance between them.

2.9 If the customer role were to dominate, an increasingly commercial relationship could develop, whose emphasis could be expected to fall more and more on the short-term satisfaction of MoD requirements. If the relationship were to develop in this way, then value for money and competitiveness might be judged on the basis of cost alone rather than the (more difficult to capture) quality and value of the research output and technical support. Moreover, MoD might increasingly question DRA's impartiality, and would have itself directly to carry more of the risk of evaluating and integrating information arising from independent contracts.

2.10 It should be remembered, however, that beyond the language of "customer-contractor" relationships, the two organisations in fact depend crucially upon one another². DRA's funds come overwhelmingly from MoD, and they are likely to continue to do so for the foreseeable future. Moreover, DRA's freedom of action is heavily constrained by MoD. For its part, MoD simply does not have alternative means of readily and reliably acquiring most of the services which are supplied by DRA. Indeed, it was felt by Sir Ronald Mason, a former CSA at MoD that

"Commercial organisations with such a high level of inter-dependency would seek to merge to reduce operational costs through the administrative effectiveness so gained" (p 170).

Agency status, and the Trading Fund arrangement, may bring benefits in sharpening responsiveness and reducing costs at DRA, but the relationship between the two organisations will always be markedly different from that which might exist in a truly commercial environment.

2.11 It is also important to note that the relationship cuts both ways. It was stated by Mr Keith Henry (p 276) that "There is no doubt that the Trading Fund status and the commercial awareness that the DRA Executive has introduced has led to a substantial improvement in service and quality".

¹ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 8.

² See Q 11, p 1, Q 730, Q 748.

But, he continued, "This is a *two way responsibility* and the MoD is also under similar pressures to perform". This means, in particular, that the Ministry, as owner of DRA, must ensure that, as customer, it presents a reasonably coherent picture of future requirements. Without a clear picture of what MoD wants in the long term, DRA cannot be expected to plan intelligently and on the timescale that is necessary to maintain the vitality of an organisation of its type. Sir Michael Simmons noted that

"The key to a successful MoD/DRA relationship is clear identification by MoD of its requirements and the associated costing/funding" (p 296).

In addition to a more sharply focused customer role, the Ministry needs also to consider a more fully developed owner role: as the Chief Executive of DRA, Mr John Chisholm, noted,

"the owner role itself could be more helpfully separated in two halves which is the owner as a, if you like, shareholder, someone who possesses an asset and wishes to see it prosper, and the owner as a regulator" (Q 743).

If, as the DRA states in its Corporate Plan, it is "an illusion"¹ to believe that business planning can be based on MoD's long term costing process, then MoD, in dialogue with DRA, must find an alternative way of establishing a view of its future expectations of DRA. MoD, as shareholder, must also ensure that DRA has reasonable freedom of action in all those respects in which it is expected to be judged as a quasi-commercial organisation.

2.12 In anticipation of such issues, under the Next Steps initiative departments have established "Fraser figures"² to act as the focal point at senior level for dealing with each Agency. In MoD's case the Fraser figure is the Deputy Under Secretary of State for Defence Procurement (DUS(DP)). However, while the Chief Executive has cited the advantages of the Fraser figure, he also noted that his role requires clarification (Q 743). Difficulties have also been identified about the operation of this system in Whitehall as a whole. On the evidence of a recent Cabinet Office report³, "the concept of the Fraser figure ... does not seem to be working well",⁴ and "roughly no more than 20 per cent of the Agencies visited [during the study] have good relationships with their parent department".⁵ If this is true of the general case, then in view of the DRA's diversity, and the variety of roles it performs, it would be surprising if its particularly complex relations with its parent department did not need regular review. As Sir Peter Kemp observed, the transfer of the defence research establishments to Agency status, while not the biggest in manpower terms,

"probably presented more difficulties and complications than most ... [DRA is] an enormously complicated organisation, far more so than most Civil Service organisations and indeed many other industrial concerns" (p 283).

2.13 Specifically, it is, we believe, important for the efficient working of DRA that means be established for MoD to decide and then communicate to DRA what it requires from the Agency in the medium term. Sir Ronald Oxburgh has noted that

¹ Corporate Plan, paragraph 1.2.1 (not publicly available).

² The Fraser figure is so-called because his or her role was created as a result of the report by Sir Hugh Fraser (commissioned in September 1990 by the then Prime Minister, the Rt Hon Margaret Thatcher MP) which recommended the establishment of such a figure. The report (*Making the most of Next Steps: the Management of Ministers' Departments and their Executive Agencies*, HMSO 1991) recommended that "Departments should consider how best they can support Ministers in their roles in relation to Agencies and identify a focal point at senior level for their dealings with each Agency", and noted the role of the figure as "both for challenging the performance of the Chief Executive and for supporting and facilitating his work in meeting his objectives and key targets".

³ *Next Steps: Moving on*, by Sylvie Trosa for the OPSS, February 1994.

⁴ *ibid*, paragraph 2.9.

⁵ *ibid*, p 28, note 12.

"there is some concern that longer term research may suffer from the new arrangements because funding is dispersed through a large and diverse group of customers with constantly changing personas and priorities" (p 158).

Without guidance, DRA cannot be expected to plan strategically. The consequence could be a general decline in crucial capabilities, such as systems integration, or a loss of skills in important technological areas, arising from an attempt to stretch diminishing resources across all areas rather than to focus on the more central requirements, or on those others which would take longest to reconstitute should the need arise (Q 569). Such a decline would, in turn, reduce DRA's capacity to advise MoD adequately, thus reducing MoD's capacity to assess new threats effectively and to act as an intelligent customer in commissioning and purchasing equipment.

DRA AND THE DEPARTMENT OF TRADE AND INDUSTRY

2.14 The Department of Trade and Industry (DTI) is the most significant funder of DRA after MoD. It plans to spend £18.1 million at the Agency in 1994-95, mainly in the area of aerospace through the Civil Aircraft Research and Demonstration programme (CARAD) and the British National Space Centre (BNSC), but also in a few other areas. DTI does not fund DRA in the same way as MoD: although it does commission some specific contracts, a large proportion of its funding is for longer term projects and the Department "considers itself a fund provider rather than a "customer" of the Agency" (p 20). DTI-funded work undertaken at DRA or undertaken elsewhere but managed by DRA "is generic, long-term research which no single company would buy. The only "deliverables" the Department receives from these funded programmes are the reports on the programmes. It is a DTI requirement that the fruits of the research are available to industry" (p 20).

2.15 However, DTI funding of these programmes is expected to decline. It was announced in March 1994 that annual spending on space science in Britain by DTI would fall from £20.4 million in 1992-93 to £6.3 million in 1996-97¹, and annual spending for civil aviation through CARAD would fall from £26.3 million to £22.7 million over the same period². This will affect DTI funding of work at or through DRA: annual DTI spending at DRA establishments is expected to fall in aeronautics from £13.3 million in 1987-88 to £8.2 million in 1995-96, and in space from £6.0 million in 1988-89 to £1.6 million in 1996-97; total DTI grants to DRA Malvern will fall from £5.85 million in 1987-88 to £65,600 in 1996-97 (pp 258-259). So while DTI and DRA may be cooperating together in "investigating ways in which wealth creating products and processes could be realised from publicly funded R&D" (p 22) and DTI hopes that DRA can maintain its role as "the centre of excellence in some key aeronautical technologies", there is little sign that the funding needed to achieve this will be forthcoming from Government, and this has dismayed a number of witnesses: the Royal Academy of Engineering, for example, believe that

"Unfortunately both MoD and DTI have reduced their funding of aeronautical research in recent years and until there is some improvement in this situation the DRA's scope for contributing will remain limited" (p 134).

2.16 The Society of British Aerospace Companies (SBAC) was not alone when it noted that "Industry's view is that the DRA/DTI linkage is weak" (p 300)³, and some have argued that DRA/DTI links are not strong enough to fulfil the Agency's potential for wealth creation. SBAC further noted that

"Recent DRA involvement with DTI has not had obvious routes by which Industry could benefit directly from the research results" (p 300).

¹ *Trade and Industry 1994 - The Government's Expenditure Plans 1994/95 to 1996/97* (Cm 2504), p 35.

² *ibid*, p 36.

³ See also p 58.

Though MoD and DTI are collaborating at the moment in some £47 million worth of joint programmes (mainly in the aerospace field and not all within DRA)¹, such a figure represents a small proportion of the total MoD research and development budget. The *Forward Look of Government-funded Science, Engineering and Technology* does, however, note the investigation of ways of strengthening the MoD/DTI relationship².

DRA, THE OFFICE OF SCIENCE AND TECHNOLOGY AND LINK

2.17 The Office of Science and Technology (OST) has little direct involvement with DRA (although it will be consulted when the Framework Document is reconsidered in 1998), and its main contribution to defence research is in running the Technology Foresight exercise and the LINK programme, and in administering the *Forward Look of Government-funded Science, Engineering and Technology*.

Technology Foresight

2.18 The Technology Foresight exercise, announced in the 1993 Science White Paper, has been set up to collect information on scientific opportunities and their potential market applications; DRA's Chief Executive, Mr John Chisholm, is a member of the Foresight Steering Group, and other DRA staff are participating in the panels (including the Defence and Aerospace panel) that have been set up to look at the specific technology areas. The first reports from the panels are expected in 1995. The Committee also note with interest evidence from Sir Geoffrey Allen describing a similar exercise being undertaken by the Institute of Materials (Q 674-695).

LINK

2.19 LINK is an interdepartmental initiative which aims to bridge the gap between the science and engineering base and industry for the benefit of the United Kingdom economy. There are 32 LINK programmes, each supporting a series of projects, with each project involving a minimum of one science and engineering base partner and one industrial partner. Government grant is 50 per cent of the total project costs, with industry providing the other half³. The OST was given responsibility for the running of the scheme in 1993, following the Science White Paper. It is currently reviewing the scheme, and a LINK Steering Committee has been established (Q 666).

2.20 DRA involvement in the LINK scheme is as yet low: it participated in a total of eight schemes at a total cost to the Agency of £1.3 million in 1993-94, which compares with total committed Government funding of £210 million since the start of the scheme (p 22). MoD stated that the requirement for DRA's contributions to count as part of the 50 per cent Government share "has undoubtedly put off potential collaborators" (p 6)⁴, and that "industry can seldom be persuaded to put as much as 50 per cent funding into defence orientated work"⁵. The Royal Academy of Engineering has suggested that DRA be regarded as an industrial partner (p 135).

The Forward Look of Government-funded Science, Engineering and Technology

2.21 The first *Forward Look* was published in April 1994. It represents the first attempt to bring together, in a single annual document, future strategy for publicly-funded science and technology across Government⁶, and its objectives include the responsibility to consider

— "any gaps or imbalances in the ... research effort ...;

¹ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 25.

² ibid.

³ See *Realising our Potential*, p 35.

⁴ See also p 300.

⁵ The Committee were told on several occasions that since production defence orders are drying up, and competitive tendering does not in any case guarantee a production contract to a company investing in the necessary R&D, industry will be increasingly unwilling to invest its own resources in defence R&D.

⁶ Published by HMSO, 1994.

⁷ ibid, preface.

- how our efforts compare with those of our principal competitors;
- the balance between civil and defence research”¹.

The *Forward Look* notes that the agenda for the forthcoming meetings of the Council for Science and Technology (CST) includes “the efforts being made by MoD to transfer more of the benefits of its substantial R&D investment into the civil sector”². Taken together, therefore, the objectives of the *Forward Look*, and the occasion of the CST meeting, provide clear opportunities for the OST to consider developments concerning DRA, in terms of the effects of DRA’s activities on the national balance of R&D, the manner in which the United Kingdom manages relations between defence and civil science and technology in comparison with competitors, and the efforts being made to link the civil and defence sectors.

DEFENCE RESEARCH: THE INTERNATIONAL DIMENSION

International cooperation

2.22 Some 8 per cent of MoD’s research activity is committed to international joint programmes³, principally in Europe and with the United States. The most significant developing aspects of international cooperation are greater European integration of defence priorities and DRA’s involvement in European programmes. DRA already seeks European (EC and non-EC) collaboration, involving itself in EC Framework Programme projects and in EUCLID, BRITE/EURAM, ESPRIT, SCIENCE, and MAST. In 1993-94, excluding EUCLID, DRA was involved in over 50 projects worth in excess of £35 million, contributing around £3.5 million towards that total. A more detailed analysis of DRA involvement in international schemes is given in the written evidence from MoD and DTI (pp 7, 24, 228 and 260). Britain also collaborates in schemes further afield than Europe, such as the Technical Co-operation Programme (with the United States, Australia, Canada and New Zealand) and the NATO Defence Research Group⁴.

2.23 The potential for further international collaboration was noted by several witnesses. Britain has good defence relations with its traditional European partners, and as former Warsaw Pact countries such as Poland, the Czech Republic and others apply for Western European Union (WEU) and NATO membership, the possibility of new collaboration increases. Furthermore, Europe’s seven largest aerospace establishments (including DRA) recently announced that they will accelerate their collaboration; they hope that there will eventually be a Union of National Aeronautical Research Establishments⁵.

2.24 The attraction of international collaboration has been noted by some witnesses, such as Dr John Field of the Cavendish Laboratory, who in stating that it will become impossible for Britain to “sustain expert intelligent customer status across the board” emphasised that “there will have to be greater selectivity in sustaining centres of expertise and greater reliance on commercial expertise or, preferably, on international Government centres” (p 266). Another witness, Pilkington Optronics, noted the value of DRA’s involvement in one of the programmes, EUCLID, by stating that the Agency

“has worked hard in our area of interest to make the programme contents useful to the United Kingdom and to its industry. The DRA’s standing is high in European defence circles due to its state of the art technological position and therefore it has been able to negotiate from strength” (pp 288-289).

¹ ibid, part 1, paragraph 2.3.

² *Forward Look of Government-funded Science, Engineering and Technology 1994*, Part 1, paragraph 5.5.

³ *Statement on the Defence Estimates 1994* (Cm 2550), p 66, paragraph 1.

⁴ ibid.

⁵ Joint document issued on 25 April 1994 by DRA and the national aerospace research laboratories of France, Italy, Germany, Sweden, Spain, and the Netherlands.

It will be important to maintain this high standing, and we therefore again note the Minister of State for Defence Procurement's view (Q 861) that privatisation would adversely affect the willingness of foreign governments to collaborate with DRA.

Defence research abroad

2.25 Britain's method of organising defence research is different from that of certain other countries, and there are aspects of such countries' arrangements which may be relevant to DRA. Particularly interesting are the examples of France and America, where national economic security is seen as an integral part of national security, and where technology transfer and dual use are given much higher priority; in America the Department of Defense draws up a list of technologies which it considers are critical to their ability to maintain a technological advantage. These countries are seen by some witnesses as offering an example for Britain to follow¹. This theme was also picked up in a recent report by the House of Commons Select Committee on Science and Technology², which considered that "MoD should have as an objective being as helpful to United Kingdom industry as the Department of Defense is to US industry".³

2.26 A review of certain features of current practice or debate over the relations between defence and civil technologies in the United States and France is given in Appendix 7. These examples are worth close study, not least for the willingness shown in both cases to contemplate a more integrated approach to the maintenance and enhancement of technological capabilities than is found in the United Kingdom, and for the openness of debate about which technologies are regarded as critical to national security in the broad sense of the term. Against this background, the statement of British strategy for defence science and technology given in the *Forward Look*⁴ still leaves room for improvement in terms of specifying clearly which technologies are seen as most critical for future defence requirements and for preserving the technological and industrial base upon which those requirements will depend.

RECOMMENDATIONS

2.27 We consider that the various structural reorganisations to which DRA has been subjected in the past few years call for a period of consolidation and stability. We note in particular that no evidence was presented to the Committee in favour of privatisation, and that the Minister himself urged caution in even considering this possibility, stating that "we have no plans for privatisation".

2.28 We recognise that the role of the Ministry of Defence is to provide for the defence of the United Kingdom. But we urge the Government to accept that economic security is an integral part of national security, and we urge them to interpret more flexibly the remit of the Ministry of Defence with respect to DRA. We encourage MoD to make wealth creation a higher priority in DRA's Framework Document.

2.29 We believe that the establishment of DRA as a Trading Fund is a welcome development. The particular arrangements of the customer/contractor principle have done much to improve the relationship between DRA and its principal customer, MoD. However, the particular arrangements whereby DRA must seek a customer for every activity it undertakes do not create an environment in which DRA can readily plan ahead and establish a strong foothold in support of wealth creation beyond the defence sector. We encourage MoD to devise systems of greater commercial freedom for DRA to give it the ability to support British industry more widely. We also urge MoD to clarify the role of the Fraser figure in this area, so as to make his role more effective.

¹ See, for example, p 64, pp 136-7, Q 592, Q 640.

² *The Routes through which the Science Base is translated into Innovative and Competitive Technology*, 1st Report from the House of Commons Science and Technology Committee, Session 1993-94, HL Paper 74.

³ ibid, paragraph 325.

⁴ *Forward Look of Government-funded Science, Engineering and Technology 1994*, chapter 8, paragraph 3.11 and 12, and Statistical Supplement part 2, chapter 2.24.

2.30 The Committee notes the fall in DTI spending at DRA, and draws specific attention to the near elimination of DTI grants to DRA Malvern since 1988-89. We encourage DTI and the OST to work towards achieving greater support for wealth creation at DRA, and to make full use of the opportunities afforded by the Agency, but we stress that there is little hope that this can be done successfully on the insufficient funding available at present.

2.31 We believe that the OST can play a beneficial role in the development of DRA. We welcome the Technology Foresight exercise and the *Forward Look*, but we consider that the OST's potential role in DRA does not stop at these programmes. OST should be given a clearer remit with respect to DRA, and this should be reflected in DRA's Framework Document.

2.32 We believe that greater flexibility in the operation of the LINK scheme is necessary. Trading Fund status has brought a greater stress on commercial practices to DRA, and we hope that a revised scheme will allow greater DRA involvement by allowing the Agency to qualify as an industrial partner.

2.33 We encourage the development of international collaboration in defence research. We agree that the duplication of research facilities by separate European countries is often wasteful, and urge Britain to negotiate with other European NATO member states to designate centres of excellence to maintain cost-effective capabilities and facilities. We are confident that, providing that these centres of excellence are chosen according to the quality of the facilities and their record of excellence, DRA will benefit strongly from such a reorganisation.

2.34 We consider that the examples of French and American defence research are worth close study, and we urge the Government to follow the progress of the American attempt to strengthen industry which has arisen through the Department of Defense's belief, shared by us, that economic security is vital to national security.

CHAPTER 3 THE DEFENCE RESEARCH AGENCY AND INDUSTRY

3.1 The network of defence research establishments in the past enjoyed a good relationship with British industry. This mutually beneficial relationship enabled Britain's forces to maintain a technical edge, while helping Britain's defence (and, to a smaller extent, non-defence) industries to establish a strong position in world markets¹. Although there seems to have been anxiety when DRA was first set up that this relationship would deteriorate to some degree, it has been stated that after a difficult initial period, improvements in these relations have recently occurred². Several initiatives (most notably the Pathfinder programme, the Strategic Alignment initiative, and the plan to set up Dual Use Technology Centres) have been introduced to promote a greater level of cooperation with industry, and these will be examined in greater detail in this chapter. However, there are a few areas where problems still exist. In particular, concern was frequently expressed about possible conflicts of interest, first, in the exploitation of the Agency's intellectual property, and, secondly, in the general area of DRA/industry competition.

3.2 The overall objective in this area was well expressed by Professor Sir William Stewart, the Chief Scientific Adviser to the Cabinet Office when he said that:

“There needs to be a mechanism whereby the Defence Research Agency has a clear set of common objectives with industry if it is going to be associated with them and, that clear set of common objectives having been established, then to come forward in a way that protects what the Ministry of Defence needs on the one hand and what industry needs on the other. I do not think that the precise details of that are yet worked out. It is something that needs a lot of attention” (Q 659).

3.3 One important aspect of such a mechanism would be to encourage the flow of staff between the Agency and industry. Such flows have undoubtedly enriched both, a principle noted in the statement in the recent White Paper on Competitiveness that

“The exchange of people is often the best way to encourage the spread of best practice, skills and technology”³.

In addition, much of DRA's work is innovative with potential applications outside the sphere of defence. Yet while some new technologies initiated at the research establishments have been successfully developed and marketed by British industry (for example thermal imaging), others have failed to attract British investors (notably the well-known case of Liquid Crystal Displays, where no United Kingdom company was willing or able to exploit this technology, which went instead to Japan). However, it should be recognised that large amounts of defence technology are unsuitable for the civil market, being too specialised for civilian use.

3.4 It is also worth noting the experience of Defence Technology Enterprises (DTE), a private company which was set up with MoD assistance in 1985 to maximise the identification, development and exploitation by industry of work carried out at selected MoD research establishments to which the company had access under suitable safeguards, and which had failed in its main purposes by the time DRA was set up.

3.5 This is not the place to go into the failure of British industry to take greater advantage of the pioneering work in Liquid Crystal Displays, or the demise of DTE⁴. However, the experiences

¹ See e.g. *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 1, paragraph 3.4.

² See, for example, p 286.

³ Cm 2563, paragraph 7.22.

⁴ For further details concerning DTE see QQ 513 and 433, and pp 252 and 270-271. See also G. Spinardi, “Defence Technology Enterprises: a case study of technology transfer” in *Science and Public Policy*, vol. 19, no. 4 (1992), pp 198-206; and paragraph 4.4 of *Relationships between Civil Science and Technology* by the Parliamentary Office of Science and Technology (POST), 1991.

of LCDs and DTE provide useful warnings against the widespread belief that successful commercial exploitation of technologies developed for military use is easy and/or inevitable.

DRA AND COLLABORATION WITH INDUSTRY

3.6 The advantages for industry and DRA in cooperating with each other are clear and easily identifiable. First, it is essential to DRA's primary role of advising MoD on technical matters, as DRA cannot be the source of all wisdom and must be able to access relevant industrial expertise; collaborative links can only help in this process. Secondly, resources of research and development held by two or more different parties can, when properly pooled, lead to a faster, cheaper and more advanced solution than is possible when parties are working alone. DRA has stated in evidence to the House of Commons Select Committee on Trade and Industry¹ that "a dual funded programme can provide far greater benefits than two separately funded and managed programmes". Yet collaboration requires good will on the part of all parties, and here industry's concern at DRA as a competitor may discourage such collaboration. However, DRA has devised methods to attract industrial collaboration, and these are examined here. They are too new to be judged decisively at present, but the Committee has been provided with evidence which gives some positive or encouraging early perceptions of these collaborative programmes.

Pathfinder

3.7 The Pathfinder programme was launched in November 1992 at a conference attended by over 300 senior representatives from industry. This programme enables participating companies (and, to a smaller extent, universities and other research institutions) to gain access to DRA's research needs at an early stage and to contribute ideas which align with their in-company, possibly civil, research programmes. DRA's stated objectives are twofold: first, to improve the value for money in MoD research by avoiding duplication and improving the take-up of existing ideas; and secondly, to provide companies with the earliest opportunity to contribute their ideas to research programmes and thus enhance the possibility of commercial exploitation.

3.8 The programme is in its second year. In its first year DRA received 640 proposals ranging in value from £50,000 to £7 million and totalling £90 million. As is to be expected when a new programme is introduced and not every business is sure of the programme's aim, many proposals were inappropriate. But 40 (valued at £20 million in total) were accepted and incorporated into DRA's research programme; a further 133 (worth about £43 million) were still under evaluation at the end of last year (p 4). In the latest year, modifications have been made to the programme to ensure that proposals are launched in specific areas of interest and that those involved in evaluation within DRA are identified clearly at the start as the point of contact for information and briefing. However, it has been noted that the programme may still require modification so as to be less of a burden on small companies which enter bids. For example, the DTI noted in written evidence that "the Department's exposure to the Pathfinder process to date suggests that it may be rather too demanding, in terms of management effort, for many small companies and that it may be more suited to the large defence contractors who are used to working with the DRA" (p 22). Those small and medium enterprises who enter unsuccessful bids may share the disappointment of Q-Par Angus, a company of 10 employees specialising in R&D, who "recognise the need for a programme such as Pathfinder in order to find the right opening for good research ideas" but believe that "The present Pathfinder system appears unnecessarily complex" (p 291). They also found the timescales involved "inordinately long, being 12 months from submission of proposal to contract award" (p 291)². MoD notes that Pathfinder is likely to be a candidate for a policy evaluation exercise (p 4).

¹ Third Report, Session 1992-93, on the British Aerospace Industry, p 73, paragraph 19 (HC Paper 563-II).

² See also p 282.

Strategic Alignment

3.9 This is a programme which was, like Pathfinder, begun in 1992. It involves building a close relationship between DRA and industry in order to facilitate, at the earliest stage in the “ideas into products” process, an exchange of knowledge and an enhanced awareness of what each side is doing and where their work is heading. Under this initiative, the Chief Executive of DRA and the manager in DRA with responsibility for a particular company visit that company and compare their research programmes and priorities. Such dialogue can help both partners in several ways, some of which were described by the Chief Executive of DRA, who noted that

“on our side, we can see that industry, particularly on the civil side of its business, is embarked upon a major investment plan which could be of interest to us. We could take account of that in ways in which we are planning our programmes or advising our customers. Similarly in relation to industry we explain to them that if there is a particular line they are interested in which frankly we have decided is going nowhere they can take a perhaps more mature view as to whether that is a good investment of their monies” (Q 810).

3.10 DRA hopes that this programme will:

- “build better mutual understanding of strategic vision and long-term technology and market trends;
- identify opportunities for technology rationalisation through mutual dependence;
- create a holistic relationship and better communication, coordination and confidence at research team level;
- obtain better value for MoD and better industrial competitiveness by optimum resource commitment; and
- promote spin-in and spin-off”¹.

The initiative focuses on about 30 fairly large companies (Q 811).

3.11 The Chief Executive of DRA noted that the initiative had generated significant interest, and that he had had discussions with several large companies (QQ 810-813). Evidence from Rolls-Royce suggested that they already had the kind of relationship which it is intended will characterise the partnerships between DRA and other Strategic Alignment companies, and they spoke of their relationship in terms of “intimacy” (Q 354). Evidence from British Aerospace at the same oral evidence session noted that their relationship with DRA was not quite so developed as that which existed between Rolls-Royce and DRA, but BAe noted that

“we have as one of our objectives a move towards the sort of relationship that Rolls-Royce have enjoyed over a number of years and we are taking active steps with the Defence Research Agency to try to achieve that objective” (Q 354).

MoD reported that the initiative “has been widely welcomed as a method of reducing duplication and waste”². However, little mention of the initiative was made elsewhere during the course of our enquiry.

¹ Spin-in: refers to the use of technologies developed for civil purposes in defence related areas; spin-off: refers to the use of technologies developed for military purposes in civil areas.

² Statement on the Defence Estimates 1994 (Cm 2550), paragraph 439.

Dual Use Technology Centres

3.12 The idea of the Dual Use Technology Centres (DUTCs) is to bring in industry and academia to work alongside DRA on projects that the Agency needs to undertake in pursuit of its customers' objectives, but which, by the nature of the technology being explored, lend themselves to further exploitation through both spin-in and spin-off. These would, it is hoped:

- "enable companies to make greater use of DRA expertise;
- provide the critical mass, cross fertilisation and breadth of expertise that companies cannot maintain intramurally;
- maintain for MoD and British industry an awareness and assessment of relevant technologies world-wide;
- achieve greater leverage from defence research;
- make strong use of work in academia and other research institutions;
- act as a conduit to related research in DRA and elsewhere;
- and produce a flow of trained technical staff to industry to achieve technology transfer".

3.13 The potential for dual use is great, and it may be helpful to list here those product areas which have been identified by DRA as having an overlap between defence and civil use. They are:

- aircraft, helicopters and aero-engines;
- avionics, vetronics¹ and control systems;
- navigation;
- satellites;
- radar;
- automated manufacturing and advanced structures;
- telecommunications and mobile communications;
- air and surface vehicle traffic management systems;
- secure, high integrity and safety critical systems;
- infra-red sensors and thermal imagers;
- surveillance and security systems;
- imagery and display systems;
- environmental monitoring; and
- parallel computing.

3.14 The first of these Centres is in the area of advanced structural materials, and is sited at Farnborough. Others are intended in several areas, including information technology software and electronics, and marine hydrodynamics. The DUTC scheme has been widely welcomed, but some

¹ i.e. vehicle electronics.

witnesses¹ consider that additional funding may be necessary from MoD, DTI and industry for their success. For example, Mr Alex Crawford, editor of *Laboratory News*, noted that

“the DUTCs need to have access to finance for capital projects that will allow them: (1) to implement strategic plans for 5-10 years ahead, and (2) to respond to short-term peaks in demand for their services” (p 254).

DRA, INDUSTRY AND INTELLECTUAL PROPERTY RIGHTS (IPR)

3.15 The establishment of DRA heralded a more formal approach to its Intellectual Property Rights than had existed under the previous arrangements. Sir Ronald Oxburgh told the Committee (Q 527) that it had been nearly impossible to estimate how much technology transferred from the establishments out of which DRA was formed to industry. However, under paragraph 4.4 of the Framework Document’s directive that “DRA’s revenue will come from payments made by customers for its services and from exploitation of its Intellectual Property”, there is a new incentive to secure as much income from IPR as is feasible, and while in 1992-93 DRA secured income from licences of £5.9 million, it is forecast that in 1993-94 that figure will be £12.0 million. At 22 February 1994, DRA had some 257 licences in force and expected to enter into new agreements at a rate of 14-16 per year, the majority of its licences being in the areas of electronics and electrical engineering, software, materials, mechanical engineering and chemicals.

3.16 The Committee was told that this new emphasis on generating income from IPR had affected relations between DRA and industry², and had also discouraged potential collaborators in the Pathfinder scheme. The CBI complained that “DRA is actively seeking to protect its Intellectual Property by replacing implied obligations of confidence with express provisions” (p 121). Principally, there were three identifiable complaints: (i) that where companies would in the past have received expertise from the establishments for a low price or even free, this expertise now came at whatever price DRA felt the market could bear; (ii) that DRA, which draws royalties and charges for licences from certain products and technologies, might not be perceived as acting impartially when advising MoD in those cases where a company which had developed a product in conjunction with DRA was one of the competing organisations for an MoD order³; and (iii) that, since maintenance was now being put out to market testing, a company could put in an underpriced bid to maintain a piece of equipment manufactured by a competitor in the knowledge that if they won the maintenance contract they would have to be given a full understanding of the technology in order to accomplish the maintenance (although this latter is addressed to MoD rather than to DRA) (Q 636).

3.17 If there was a clear objective for DRA to underpin the defence industry, the British taxpayer’s interest might be better served by giving British industry preferential treatment over IPR, within the limits set by the international frameworks governing such matters. This preferential treatment may consist of either releasing IPR to British industry at lower prices than the international market might bear or the right of first refusal when DRA is marketing new IPR. However, under Articles 92 and 93 of the Maastricht Treaty, the scope for any preferential treatment of British industry in this area is very limited. As regards the second complaint listed above, safeguards have been put in place by the DRA with the aim of ensuring fair play. “Chinese Walls”⁴ have been set up where DRA are both advising MoD and either advising, collaborating with or receiving IPR revenue from a bidder; the Agency guarantees to protect the IPR of bidders for the Pathfinder programme; DRA employs an “Ombudsman” to investigate specific complaints;

¹ See, for example, p 282.

² See, for example, p 183 and p 291.

³ Smith System Engineering, who also advise MoD, argued that DRA’s integrity as advisors to MoD would be better served if it did not hold IPR (QQ 212-215).

⁴ This phrase refers to the process which is used when DRA advises the customer as to what he should buy while at the same time advising one or more bidders in the preparation of their bid. Impartiality is maintained by identifying two separate managers together with support staff who become either part of the team supporting the Procurement Executive or that supporting the bidder(s). Strict commercial confidentiality is maintained throughout, and staff used in one team may not participate in the other even if their original involvement has ended.

and there is a Market Testing Review Board, which has a majority of non-DRA members and which looks into the running of the market testing and secondary competition programmes. Yet even if DRA acts with perfect propriety on such occasions (and there is no suggestion that they do act or have ever acted with impropriety), perceptions can be damaging. In particular, the issue of Chinese Walls greatly concerned several of our witnesses, with the CBI noting that “the concept of Chinese Walls has yet to be proven to be totally effective” (Q 444).

COMPETITION BETWEEN DRA AND INDUSTRY

3.18 Whereas before the creation of DRA the Establishments enjoyed a non-competitive relationship with industry and the two parties did not compete, the first Chief Executive of DRA, Nigel Hughes (now Director of Technology with Smiths Industries Aerospace Group) testified (Q 329) before the Committee that, in conformity with the Government’s wishes at the time, DRA “started by projecting a fairly aggressive, competitive and commercial image … [that] has inevitably raised greater uncertainties in the mind of industry, and those uncertainties will take rather longer to evaporate”. This concern has been acknowledged in evidence by the DRA (pp 223-226) which claims that the largest arena of competition between industry and DRA will actually be for that part of DRA’s current business that is now being opened up for competition, and so argues that industry can only gain from these new opportunities to compete for DRA business. DRA further note the suggestion that “one consequence of what must inevitably be an increase in opportunity for industry” might be that DRA would “seek to claw back contracts which have traditionally been placed in industry in the Extra Mural Research (EMR) programme” (p 225), and which have served the vital purpose of smoothing the flow of technology between DRA and industry. DRA say that they recognise this danger and have responded with a policy which “depends very heavily on ensuring that the best of what industry can offer is incorporated into the defence research programme” (p 225). While many witnesses have stated that matters have improved in the last two to three years with the toning down of DRA policy as regards competition with industry, and that industry is now more sure of where they stand *vis à vis* DRA, there is still a residual fear that the Agency may yet return to a more aggressive competition policy and, therefore, the issue of competition still concerns industry to a great extent. Several witnesses were considerably concerned that there was a conflict of interest in DRA’s position as both adviser and supplier to MoD¹. However, Sir Michael Simmons stated that such concerns might be “something of a smoke screen set up by industry in case the DRA proved too competitive” (p 296).

3.19 The privileged position of DRA is a specific concern, Chinese Walls notwithstanding. The Agency, acting as MoD’s adviser, can acquire detailed information on the cost structures of individual firms. As British Aerospace put it, “There is undoubtedly significant scope for actual or perceived conflicts of interest and a perception of unfair competition to arise as long as DRA is tasked with being Supplier, Adviser and Arbiter of the MoD’s research needs, and with undertaking secondary competition with industry in meeting those needs” (p 101). While these may, given time, turn out to be a matter of misunderstanding, they appear at present to raise serious questions about the willingness of industry to maintain the openness towards DRA that is essential if the Agency is to be able to access industry’s expertise in its role as MoD’s principal technical adviser. Sir Ronald Oxburgh noted that “privileged access to defence contractors’ research programmes and plans … has declined to some extent because the DRA is seen as a potential competitor”². He stated that one result of this is that it is “more difficult for the DRA to give MoD advice based on a comprehensive technical oversight of what is being done in the United Kingdom as a whole” (p 158).

3.20 It is relevant to note that, in competing with industry for MoD contracts, DRA is disqualified from entering into certain practices normal in industry. The Agency is at a disadvantage in competing for contracts against those firms (and foreign agencies) which choose to undertake

¹ See, for example, pp 23, 101-102, 119, 130, 183, 256, 299-300 and Q 195.

² See also p 119.

a policy of "loss-leading".¹ While we would not wish to encourage DRA to undertake such a practice, it will be necessary to ensure that the Agency is not penalised because of loss-leading competition. In addition, accounting procedures frequently differ between organisations, and DRA, with its very tight accounting rules, may sometimes be at a disadvantage.

RECOMMENDATIONS

3.21 Like the majority of our witnesses, we too believe that the Pathfinder programme is one that should be encouraged and welcomed. We recognise that many of the problems encountered so far can be attributed to the fact that the programme is new. Yet we believe that the programme requires refinement if more small and medium enterprises are to become involved, and we encourage DRA to take account of the limited resources of these companies in a more positive way. We also consider that the programme's ultimate success depends upon it benefiting DRA's partners as much as, and perhaps more than, DRA itself.

3.22 We welcome the Strategic Alignment initiative as a potentially very effective method of ensuring beneficial dialogue between DRA and industry. We encourage DRA to expand the programme so as to include more small and medium-sized enterprises.

3.23 The Committee welcome the establishment of DRA's first Dual-Use Technology Centre, and encourage the wider science base to make full use of the opportunities which it offers. We look forward to the expansion of the programme.

3.24 We welcome the establishment of the Market Testing Review Board. But we consider that, in the absence of total transparency in the market for defence research, there are potential pitfalls in the rigorous implementation of the Government's policy of market testing which the Board must guard against.

3.25 We believe that it is more important for the national interest for DRA to have good relations with industry than high or rapidly accumulated IPR revenues. In addition we believe that it is not always in Britain's interests to maximise IPR revenues in the first instance: where long term collaborative ventures between DRA and British industry can be arranged, such options should often be encouraged in preference to sales of IPR to foreign companies.

3.26 The Committee note the fears of industry that the roles of DRA as adviser to MoD, holder of IPR and competitor for MoD contracts offers scope for potential conflicts of interest. We also note that DRA can act in total good faith but leave industry with a perception that it may have done otherwise, thus causing as much damage to open DRA/industry relations as any real conflict of interest. We therefore recommend that independent audits of the Agency's "Chinese Wall" mechanism be published, and we recommend the appointment of an independent ombudsman with relevant industrial expertise.

¹ i.e., bidding at a price below cost in the hope of gaining a competitive advantage.

CHAPTER 4 THE DEFENCE RESEARCH AGENCY AND SCIENCE

4.1 The research establishments which were brought together to form DRA enjoyed a formidable world-class reputation for the quality of their science and technology, but were criticised for being inadequately responsive to the needs of their main customer, the Ministry of Defence. Mr Keith Henry has stated that "The rationalisation of the Defence Research Establishments was long overdue" (p 277) and Sir Ronald Oxburgh noted that the establishments were characterised by

"a degree of unresponsiveness, programme costs that were not always clearly visible from the centre, and some inefficiency and duplication of activity resulting at least in part from organisational and geographical dispersion" (p 159)¹.

The new status has put the emphasis on value for money and responsiveness by increasing competition for MoD contracts and by placing the money for these contracts in the hands of the individual MoD customers. MoD have noted that DRA is a "very much more responsive organisation" and that "value for money is better" (Q 6).

4.2 While this policy is likely to bring certain benefits to the taxpayer at least in the short run, it has been claimed that it will result in DRA being a less attractive place for scientists to work, and will cause DRA to place the emphasis for its research programme on short term goals at the expense of more strategic research². These issues will be dealt with below.

WORKING CONDITIONS AT DRA

4.3 The concern that DRA's new status might result in it being a less attractive place for scientists to work arises from fears that, first, there would be fewer opportunities for them to follow up their own ideas and, secondly, they would be required to spend more time on management and writing reports and would therefore have less time to spend on research. Evidence often suggested that bureaucracy was on the increase³, and a former Chief Scientific Adviser to MoD, Sir Ronald Mason, criticised the new requirement to use staff time to market DRA to MoD (p 170). The Royal Academy of Engineering, for example, stated that DRA favoured staff with "entrepreneurial skills ... rather than research excellence" (p 133), and Professor A C Baynham, Principal of the Royal Military College of Science at Shrivenham, noted that DRA was sending fewer scientists on Continuing Professional Development programmes at his college (Q 170); evidence from the Institution of Professionals, Managers and Specialists (IPMS), which represents many of DRA's scientific staff, suggested that this was because the scientists now had less time to do so (QQ 270, 272).

4.4 However, DRA has more freedom under the 1993 Framework Document to reward its scientists in other ways, and is required by paragraph 2.3 of the Document to "create an environment which places the highest value on the motivation and development of individuals". For example, there are now opportunities to set new scales of pay and conditions of employment, and paragraph 9.2 of the Framework Document states that "The intention is that DRA should develop its own pay and grading structure and be empowered to make other changes in Civil Service personnel policies appropriate to its circumstances". But this may in some areas cause new problems: for example, in the area of MoD-DRA personnel interchange it has necessitated an interchange agreement between MoD and DRA which provides for annual negotiation of the numbers, grades and specialisms to be interchanged and the duration and terms of exchanges, and for an assessment of future needs taking account of the flow of staff⁴. The Framework Document also envisages the same happening with regard to OGDs; and evidence from the IPMS (p 60) and

¹ See also p 295.

² See, for example, pp 39-40, 65, 170, 247.

³ See, for example, pp 103, 130, 147, 180, 247, 283, 295.

⁴ Framework Document, paragraph 9.6.

from Air Marshal Sir Michael Simmons, Deputy Controller Aircraft in MoD Procurement Executive (PE) between 1989 and 1992 (p 296) pointed out the potential problem that if relatively well paid DRA staff were required by the PE, those staff would be unwilling to revert to normal Civil Service pay scales, and if they were guaranteed to be paid on DRA pay scales, this would lead to resentment among those who moved to MoD (PE) Headquarters before the formation of DRA¹. Sir Michael noted that "these individuals have constituted a core of specialist expertise in project offices for which no other source is obviously apparent". However, MoD noted that while at first this issue "was going to be a cause for concern", it believed it to be no longer a problem (Q 849).

4.5 DRA's new freedoms will allow it to increase greatly the ratio of qualified scientists and engineers to support staff (from 0.7:1 in 1988 to 2.5:1 in 1999), and DRA intends through this rationalisation to achieve the same amount of scientific activity in 1996 as it did in 1993 (despite the fall in programmed MoD income by 15 per cent over this period)². However, under this programme, many support staff will lose their jobs, and scientists and engineers may have to undertake some of their tasks. The unions who represent these support staff have been understandably critical of this aspect of the programme, noting that the speed and method of the rationalisation programme "has left staff demoralised" (p 56). Particular criticisms have been made regarding the cuts in engineering support services: DRA staff in this area contributing evidence to the Committee noted the benefits of research and technical support staff working side by side, stating that, under an external contract, DRA could not keep modifying a piece of work in the way that they were able to do with appropriate in-house technical support (Q 254)³.

4.6 DRA also hopes to achieve improvements in standards and efficiency by the completion of certification to BS5750 by the end of 1996⁴ and by the implementation of a Total Quality Management philosophy⁵.

DRA'S CAPABILITIES AND FACILITIES

4.7 As well as being one of Britain's largest employers of qualified scientists and engineers, DRA is the owner of several unique capabilities and facilities. MoD supports these in recognition of the fact that

"Defence research programmes are directed to support defence roles and change to reflect changing priorities. The aim must always be to maintain that degree of capability in advanced technologies that will deliver the decisive advantage to our armed forces in any future conflict".⁶

However, many of these facilities are used at levels very much below capacity, such as the ship testing tanks which the Committee visited at DRA Haslar. Although paragraph 6.4 of the Framework Document states that

"The Secretary of State may, exceptionally, direct the Chief Executive to undertake work or maintain capabilities incompatible with existing commitments or normal commercial practice. DRA will suffer no financial detriment as a result of such a direction",

there is considerable concern that such facilities may lose the support which they currently have from MoD, and will have to close as a result. This would not only be harmful to British industry, which would suffer at the expense of those foreign competitors which enjoy in some cases subsidised access to overseas facilities: it would also affect the several other research organisations

¹ See also p 60.

² *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 9.

³ See also pp 271-272.

⁴ Corporate Plan 1994-1999, p iii.

⁵ See also QQ 696-703, Q 576, p 57, Q 278.

⁶ *Statement on the Defence Estimates 1994*, paragraph 435.

within (and without) universities which have benefitted from links with such facilities, and many witnesses see such facilities as national assets whose future needs to be assured. The Royal Academy of Engineering stated that

"There should be financial mechanisms for maintaining the availability of selected facilities which are judged likely to be required for important projects or research within, say, the next decade. It is regrettable that a listing of such facilities as "national assets" in the run-up to the vesting of the DRA, put forward by the research establishments which now make up the DRA, appears to have secured no such sympathetic response from MoD and DTI" (p 138),

and Professor Sir William Stewart noted that

"The Defence Research Agency ... has unique resources and facilities to help UK industry, to help UK science and technology, and I believe that should be provided by and supported by the public purse" (Q 661).

DTI has, however, expressed its concern that, in reviewing the future of its facilities "during a period of recession", DRA might underestimate the demand for and viability of these facilities, mentioning in particular DRA's 24ft low speed wind tunnel (p 21).

4.8 There is a concern that MoD may inadequately compensate DRA for the maintenance of uneconomical facilities. The *Forward Look of Government-funded Science, Engineering and Technology* states that

"Notwithstanding the DRA's increasing cost-efficiency, it is still the case that the MoD customers' declining funds cannot buy the full range of Defence research capability that they would ideally like to have. A further way in which the DRA has responded to this decline is to seek to expand its non-MoD customer base as a means of spreading the overheads of its essential Defence facilities and research teams"¹.

Indeed, it is a central element of DRA's Corporate Plan to invest for the generation of revenues from non-MoD sources in order to provide a buffer against variability in MoD demand as well as making a useful contribution to defraying DRA's fixed costs to the benefit of MoD customers generally.

4.9 Evidence from Rolls-Royce, which relies heavily on certain uneconomical facilities owned by DRA, points out that access to such facilities is necessary if the company is to compete on equal terms with its main competitors in the United States, General Electric and Pratt & Whitney, which have access to similar facilities. Each of these companies would be unable to justify the cost of maintaining these facilities on their own, but the consequence of DRA closing certain facilities due to their being uneconomic would be to reduce the ability of Rolls-Royce and other British companies to compete with their American rivals. British Aerospace noted with regard to DRA's wind tunnels that they are

"essential to the whole process of designing commercially viable and defence capable aircraft and we certainly see the continued availability of the Defence Research Agency wind tunnels as being very important to our future competitiveness" (Q 377).

The CBI, amongst others, noting that certain facilities owned by DRA are unique in Britain, believes that they should be maintained (p 120).

4.10 There is also concern that Treasury rules place DRA in an unrealistic financial situation by demanding certain rates of return on its facilities which prevent greater utilisation, and (with

¹ *Forward Look of Government-funded Science, Engineering and Technology 1994*, part 2, chapter 8, paragraph 10.

respect to some older facilities) by overvaluing them through not taking adequately into account their age or lack of "saleability". Treasury rules also prevent DRA from costing these facilities marginally. This might increase their vacancy rates, although the Deputy Chief Scientific Adviser to MoD (DCSA), who until April of this year was Managing Director (Operations) at DRA, stated that he was

"not aware of any instance where reducing the facilities to what I think you would know as marginal cost is going to make a significant difference to the amount of that facility's time that you could sell to other interested parties" (Q 829).

DRA'S LONG TERM RESEARCH

4.11 According to MoD classifications, DRA does no purely basic research¹. However, the Agency does a significant amount of work for MoD's DCSA (and a small amount of work for others) which can be classified as strategic research of a long term nature. Currently, the DCSA's research budget totals around 7 per cent of DRA's total revenue, but many fear that the contribution of the DCSA may, in the future, fail to keep up either as a fraction of DRA's income or in real monetary terms. Concern was raised by Professor Baynham that, in addition, the research stage known as concept development and evaluation (CDE), which immediately follows strategic research, was in danger of being neglected (p 38, Q 161).

4.12 Although evidence to the Committee brought up fears for the future of long term research, there was a singular failure amongst witnesses to name a specific instance of this problem, even where the witnesses giving oral evidence had been asked by the Committee to find examples. An explanation of this apparent contradiction could be that the new status of the DRA is too recent a development for any specific instances of this problem to have yet arisen, and this fear seems to be instinctive rather than rooted in concrete examples, being based upon a sense of how the financial pressures might operate (unless deliberately resisted). Yet instincts cannot be disregarded until a mechanism of safeguarding long term research has been identified.

4.13 One possible method of safeguarding this longer term work would be for DRA to charge a "Rothschild levy"² on its prices for contract work, which would fund its strategic research. There are dangers in this in that higher research costs might encourage customers to go elsewhere; and although DTI supports such levies and has implemented them in its own laboratories (QQ 122-124), neither DRA (Q 748) nor MoD supports this principle. We note the evidence of MoD (Q 881) that consideration is being given to a redefinition of the area called strategic research (currently some 8 per cent of the MoD's research expenditure) to include "the current strategic programme and much more of the so-called technology underpinning research". This would bring some 20-25 per cent of the research expenditure into this new category, for which the DCSA proposed the term "corporately funded research".

DRA's ENTERPRISE FUND

4.14 DRA in 1993-94 established an "Enterprise Fund" (QQ 772 and 783, pp 222-223) which uses some of the income which DRA receives from licensing and royalty payments on the DRA patent portfolio. The fund provides money for two purposes: first, the development and exploitation of potential wealth creating ideas that originate from within the Agency; and secondly, the allocation of small incentive awards for staff who have made a significant contribution to any particular project or idea.

4.15 In its first year, the scheme attracted a total proposed expenditure of only £250,000, a sum equivalent to roughly 2 per cent of DRA's royalty income. However, as awareness of the

¹ Ministry of Defence memorandum to House of Lords Select Committee on Science and Technology, printed in 3rd Report, Session 1989-90, on Definitions of R&D, p 81.

² The concept of such a levy was established in a report by Lord Rothschild written in 1971. Its guiding principle is that longer term research at Government laboratories and research institutes should be funded by a levy of around 10 per cent on all business bought at the research establishment. In practice the levy has rarely been added.

scheme grows among the Business Sectors, it is expected that proposals for considerably more funding will be put forward.

4.16 MoD is cautiously supportive of this fund, but implied that it would, in consultation with the Treasury, set an upper limit for it (QQ 835 and 856). However, the Agency considers that the fund

“is going to be of vital importance in ensuring that DRA has the ability to exploit the wealth creating potential of research that may not be relevant to its primary defence aims, but which may nevertheless be of value to industry or the community generally. Unless we in the DRA are able to do this, then we will not be able to achieve that added value which both the Government and taxpayer have a right to expect from their initial research investment” (p 223).

A REVISED ROLE FOR DRA

4.17 Earlier reports from ACOST¹ and POST² have noted that Britain keeps defence research and development separate from civil to a degree that is unusual by international standards. Some of the recent developments at DRA appear to recognise the disadvantages of such a position, from the perspectives both of earning income for DRA by transfer of technology to wider uses, and of enabling the defence sector to draw more readily on the whole range of technology available from British industry. However, there remains a widespread perception that attempts to widen the scope of DRA’s work, so as to enable it to relate more broadly to the United Kingdom technology and industrial base and to contribute to wealth creation, are being seriously impeded. As Dowty Aerospace Europe put it:

“It has been paraphrased elsewhere that “the DTI has the mandate to support United Kingdom industry but no money, whilst the MoD has the money but no mandate. If the involvement in dual use technology is merely a means of both MoD and DTI reducing costs, then it will fail. There is a need for MoD to change its attitude towards supporting United Kingdom industry and for the DTI to provide its share of the funding”” (p 263).

4.18 The usual analysis of this position is that the Treasury’s guidelines prevent MoD from investing in activities which have purposes of other than direct relevance to defence. Whatever may have been the situation in the past, there are now signs of movement.

4.19 First, MoD itself has said (p 6) that “whilst the DRA would not embark on a programme of work unless it was required for defence purposes, it recognises and is now seeking to exploit the dual use potential of many of those technologies for the general good of British industry”.

4.20 Secondly, DTI referred in oral evidence to a markedly changed relationship with MoD/DRA since the summer of 1993 and the publication of the Science White Paper *Realising our Potential*.

4.21 Thirdly, OST has argued that DRA’s Framework Document (paragraph 2.2) “specifically empowers the DRA to meet the requirements of other public sector or private sector customers. Thus wealth creation is a proper subsidiary activity of the DRA” (p 194). It also notes that its Forward Look exercise will “consider the scope for greater concerted action and collaboration both within publicly-funded S&T and between the public and private sectors; the balance between civil and defence research; and any gaps and imbalances in the national research effort” (p 192).

4.22 Finally, the Treasury, in answer to the question whether it would restrict MoD from granting DRA permission to invest in any facilities that MoD felt to be appropriate, has said that, subject to standard rules about delegated authority,

¹ *Defence R&D: a National Resource*, ACOST Report published by HMSO, 1989, paragraph 1.12.a.

² *Relationships between Defence and Civil Science and Technology*, POST Report, 1991.

“Approval for DRA to invest in specific facilities is primarily a matter for MoD taking account of its current and future research and development needs and whether the proposed facility requested gives good value for money” (p 304).

The Treasury has also said that

“There would be no objection in principle to MoD and DTI jointly financing a particular DRA research project if both Departments considered this represented good value for money given other competing priorities for the use of public funds and was consistent with their objectives” (p 304).

Naturally, the obligations to demonstrate value for money and consistency with departmental objectives leave scope for Treasury intervention. But the question can at least be raised as to the real source of inhibition against DRA playing a larger wealth creation role: does it arise primarily from Treasury restrictions bearing specifically on the boundary of defence activities (as opposed to ordinary Treasury pressure on public spending), or from a combination of (a) limited DTI funds for joint projects, and (b) MoD prudence about putting proposals of more than purely defence purpose high in its list of priorities, thus possibly jeopardising purely defence activities lower down the list?

4.23 Speaking on this question to the House of Commons Select Committee on Science and Technology, the Chancellor of the Duchy of Lancaster, the Rt Hon William Waldegrave MP, said that “he did not want to blame this on the Treasury”, but rather on Government policy more generally. He also stated that, while the Government continues to believe in the current policy, it is at least “worth debating” the argument for a change of policy.¹

RECOMMENDATIONS

4.24 We consider that Treasury rules place an unnecessarily high burden upon DRA. The current target rates of return appear unrealistic, and we consider that DRA should be able to charge customers at marginal costs where appropriate; to do otherwise would place the future of many unique and vital facilities in the United Kingdom in jeopardy.

4.25 The Committee note fears that DRA will be forced by the needs of greater commercial discipline to focus on more short term research and development at the expense of longer term research. Although no specific evidence has been submitted to the Committee of examples where this has happened, the Committee accept that such fears may be well-founded. We welcome the steps to bring larger amounts of MoD spending at DRA within the control of the Deputy Chief Scientific Adviser.

4.26 The Committee supports DRA’s Enterprise Fund, and strongly recommends that all IPR royalties should be retained by DRA for the purposes of this fund.

4.27 The Committee encourages the Government to find means to enable DTI and OST to support wealth creating activity at DRA, even if that can only be achieved by granting those Departments a share in the ownership of DRA. In addition, the Committee has already recommended² that the Government’s Chief Scientific Adviser be “empowered to expose any inconsistencies in the science plans of departments to public scrutiny”. Within this framework, we further recommend that he should be specifically empowered to expose any practices which impede closer links between civil and military science and technology.

¹ HC Paper 74.

² *Priorities for the Science Base*, HL Paper 12-I, Session 1993-94, paragraph 2.78.

CHAPTER 5 SUMMARY

5.1 The Committee recognises the achievements of the scientists and engineers of the establishments which now comprise DRA and the contribution they have made not just to defence but also to the United Kingdom science and technology base. We have also been encouraged throughout the course of this enquiry by the quality of DRA's management.

5.2 We consider that the various structural reorganisations to which DRA has been subjected in the past few years call for a period of consolidation and stability. We note in particular that no evidence was presented to the Committee in favour of privatisation, and that the Minister himself urged caution in even considering this possibility, stating that "We have no plans for privatisation". (2.27)

5.3 We believe that the establishment of DRA as a Trading Fund is a welcome development. The particular arrangements of the customer/contractor principle have done much to improve the relationship between DRA and its principal customer, MoD. However, the particular arrangements whereby DRA must seek a customer for every activity it undertakes do not create an environment in which DRA can readily plan ahead and establish a strong foothold in support of wealth creation beyond the defence sector. We encourage MoD to devise systems of greater commercial freedom for DRA to give it the ability to support British industry more widely. We also urge MoD to clarify the role of the Fraser figure¹ in this area, so as to make his role more effective. (2.29)

5.4 We recognise that the role of the Ministry of Defence is to provide for the defence of the United Kingdom. But we urge the Government to accept that economic security is an integral part of national security, and we urge them to interpret more flexibly the remit of the Ministry of Defence with respect to DRA. We encourage MoD to make wealth creation a higher priority in DRA's Framework Document. (2.28)

5.5 We believe that the OST can play a beneficial role in the development of DRA. We welcome the Technology Foresight exercise and the *Forward Look*, but we consider that the OST's potential role in DRA does not stop at these programmes. OST should be given a clearer remit with respect to DRA, and this should be reflected in DRA's Framework Document. (2.31)

5.6 The Committee encourages the Government to find means to enable DTI and OST to support wealth creating activity at DRA, even if that can only be achieved by granting those Departments a share in the ownership of DRA. In addition, the Committee has already recommended² that the Government's Chief Scientific Adviser be "empowered to expose any inconsistencies in the science plans of departments to public scrutiny". Within this framework, we further recommend that he should be specifically empowered to expose any practices which impede closer links between civil and military science and technology. (4.27)

5.7 The Committee notes the fall in DTI spending at DRA, and draws specific attention to the near elimination of DTI grants to DRA Malvern since 1988-89. We encourage DTI and the OST to work towards achieving greater support for wealth creation at DRA, and to make full use of the opportunities afforded by the Agency, but we stress that there is little hope that this can be done successfully on the insufficient funding available at present. (2.30)

5.8 We believe that greater flexibility in the operation of the LINK scheme is necessary. Trading Fund status has brought a greater stress on commercial practices to DRA, and we hope that a revised scheme will allow greater DRA involvement by allowing the Agency to qualify as an industrial partner. (2.32)

¹ An explanation of the Fraser figure can be found in paragraph 2.12.

² *Priorities for the Science Base*, HL Paper 12-I, Session 1993-94, paragraph 2.78.

5.9 Like the majority of our witnesses, we too believe that the Pathfinder programme is one that should be encouraged and welcomed. We recognise that many of the problems encountered so far can be attributed to the fact that the programme is new. Yet we believe that the programme requires refinement if more small and medium enterprises are to become involved, and we encourage DRA to take account of the limited resources of these companies in a more positive way. We also consider that the programme's ultimate success depends upon it benefiting DRA's partners as much as, and perhaps more than, DRA itself. (3.21)

5.10 We welcome the Strategic Alignment initiative as a potentially very effective method of ensuring beneficial dialogue between DRA and industry. We encourage DRA to expand the programme so as to include more small and medium-sized enterprises. (3.22)

5.11 The Committee welcome the establishment of DRA's first Dual-Use Technology Centre, and encourage the wider science base to make full use of the opportunities which it offers. We look forward to the expansion of the programme. (3.23)

5.12 We consider that Treasury rules place an unnecessarily high burden upon DRA. The current target rates of return appear unrealistic, and we consider that DRA should be able to charge customers at marginal costs where appropriate; to do otherwise would place the future of many unique and vital facilities in the United Kingdom in jeopardy. (4.24)

5.13 The Committee note the fears of industry that the roles of DRA as adviser to MoD, holder of IPR and competitor for MoD contracts offers scope for potential conflicts of interest. We also note that DRA can act in total good faith but leave industry with a perception that it may have done otherwise, thus causing as much damage to open DRA/industry relations as any real conflict of interest. We therefore recommend that independent audits of the Agency's "Chinese Wall" mechanism be published, and we recommend the appointment of an independent ombudsman with relevant industrial expertise. (3.26)

5.14 We encourage the development of international collaboration in defence research. We agree that the duplication of research facilities by separate European countries is often wasteful, and urge Britain to negotiate with other European NATO member states to designate centres of excellence to maintain cost-effective capabilities and facilities. We are confident that, providing that these centres of excellence are chosen according to the quality of the facilities and their record of excellence, DRA will benefit strongly from such a reorganisation. (2.33)

5.15 We consider that the examples of French and American defence research are worth close study, and we urge the Government to follow the progress of the American attempt to strengthen industry which has arisen through the Department of Defense's belief, shared by us, that economic security is vital to national security. (2.34)

5.16 We welcome the establishment of the Market Testing Review Board. But we consider that, in the absence of total transparency in the market for defence research, there are potential pitfalls in the rigorous implementation of the Government's policy of market testing, which the Board must guard against. (3.24)

5.17 The Committee note fears that DRA will be forced by the needs of greater commercial discipline to focus on more short term research and development at the expense of longer term research. Although no specific evidence has been submitted to the Committee of examples where this has happened, the Committee accept that such fears may be well-founded. We welcome the steps to bring larger amounts of MoD spending at DRA within the control of the Deputy Chief Scientific Adviser. (4.25)

5.18 The Committee supports DRA's Enterprise Fund, and strongly recommends that all IPR royalties should be retained by DRA for the purposes of this fund. (4.26)

5.19 We believe that it is more important for the national interest for DRA to have good relations with industry than high or rapidly accumulated IPR revenues. In addition we believe that it is not always in Britain's interests to maximise IPR revenues in the first instance: where long term collaborative ventures between DRA and British industry can be arranged, such options should often be encouraged in preference to sales of IPR to foreign companies. (3.25)

APPENDIX 1

The members of the Sub-Committee who conducted the enquiry were:

L. Chorley
L. Craig of Radley
B. Hilton of Eggardon
L. Howie of Troon
B. Platt of Writtle
L. Redesdale
L. Renwick
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The Sub-Committee appointed as their Specialist Advisers:

Professor Frank Hartley CChem FRSC
Vice Chancellor
Cranfield University;

Professor Philip Gummell
Professor of Government and Technology Policy
University of Manchester.

APPENDIX 2

List of witnesses

The following witnesses gave evidence. Those marked * gave oral evidence.

- * Association of Independent Research and Technology Organisations (AIRTO)
- * Professor Sir Geoffrey Allen Kt FRS FEng FRSC FInstP
- Australian High Commission
- J F Barnes CB
- * Professor A C Bayham rcds
- * British Aerospace plc
- Civil and Public Services Association (CPSA)
- * Confederation of British Industry, Defence Contracts Panel
- Professor M Cordey-Hayes
- A Crawford, Editor, Laboratory News
- Defence Manufacturers Association
- * Defence Research Agency
- * Defence Research Agency Industrial Trade Unions Consultative Committee
- * Department of Trade and Industry
- Dowty Aerospace Europe
- Electronic Data Systems Ltd (EDS)
- FR Group plc
- Sir John Fairclough FEng FIEE FBCS
- * Federation of the Electronics Industry (FEI)
- Dr J E Field FRS OBE
- Sir Colin Fielding Kt CB
- GMB
- Embassy of the Federal Republic of Germany
- Keith N Henry, Brown & Root Ltd
- * Nigel H Hughes CEng FIMechE, Smiths Industries Aerospace
- R Hughes, Ferranti-Thomson Sonar Systems UK Ltd
- Institute of Biology
- Institute of Physics
- * Institution of Electrical Engineers
- * Institution of Professionals, Managers and Specialists (IPMS)
- Sir Peter Kemp KCB FCA
- M Lawrence, Prudential Corporation plc
- * Ministry of Defence
- * Manufacturing, Science and Finance Union (MSF)
- * Sir Ronald Mason KCB FRS
- * Ministry of Defence
- * Office of Science and Technology
- * Sir Ronald Oxburgh KBE FRS
- Pilkington Optronics Ltd
- Professeur Alain Pompidou MEP MD
- Q-Par Angus Ltd
- Sir Charles Reece KBE FRSC
- Ring Sights Ltd
- * Rolls Royce plc
- * Royal Academy of Engineering
- Royal Aeronautical Society
- Royal Society of Chemistry
- Air Marshal Sir Michael Simmons KCB AFC
- K F Slater
- * Smith System Engineering Ltd
- Society of British Aerospace Companies Ltd
- * Professor Sir William Stewart FRS FRSE, Office of Science and Technology
- General Sir John Stibson KCB OBE
- Professor J L Stollery CBE FEng
- Vickers Shipbuilding and Engineering Ltd (VSEL)
- Vosper Thorneycroft (UK) Ltd
- Westland Group plc

APPENDIX 3

Invitation to submit written evidence

The House of Lords Select Committee on Science and Technology have appointed a Sub-Committee, under the chairmanship of the Earl of Selborne, to enquire into the Defence Research Agency (DRA).

The Sub-Committee invite written submissions on any matters relevant to their terms of reference and in particular on the following questions. It may be that not all the questions will be relevant to your concerns, in which case you should be selective.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MoD

- 1.1 How independent of the MoD is the DRA?
- 1.2 Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?
- 1.3 How does the DRA's status affect its research strategy?
- 1.4 How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?
- 1.5 How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?
- 1.6 How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War? Among the factors that might have to be taken into account are:
 - the shift in focus of defence policy from the East-West confrontation towards more localised conflicts such as the Gulf, Somalia and the former Yugoslavia, together with concern about proliferation of weapons of mass destruction, with possible consequent changes in equipment requirements;
 - the combination of downward financial pressure on the defence budget and upward pressure arising from the desire to incorporate ever newer technology into military equipment;
 - the effect of State sponsored and other forms of terrorism on the roles and equipments of our Armed Forces;
 - the question of how, in such circumstances, to determine which are the technological capabilities that must be retained within the United Kingdom in general, and the DRA in particular.
- 1.7 The DRA, like its predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?

2. THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY

- 2.1 Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?
- 2.2 Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?
- 2.3 What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?
- 2.4 Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take-up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refining and how can it be improved?
- 2.5 How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?

3. THE DRA'S RELATIONS WITH INDUSTRY, EUROPE AND THE WIDER WORLD

- 3.1 Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?
- 3.2 What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?
- 3.3 How does the DRA connect to the Technology Foresight exercise being conducted by the OST?
- 3.4 How effective are the DRA's links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?
- 3.5 Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?
- 3.6 What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?
- 3.7 How should it relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?
- 3.8 How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?
- 3.9 What kind of relationship exists with the EC Framework Programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?
- 3.10 Does the DRA seek European collaboration as a matter of course?
- 3.11 Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?

INSTRUCTIONS TO WITNESSES

Evidence should be submitted to me, the Clerk of Sub-Committee II (Defence Research Agency), Select Committee on Science and Technology, House of Lords, London, SW1A OPW by Monday, 10 January. Evidence must be clearly typed or printed on one side of A4 paper and take the form of an original copy. It would assist the Sub-Committee if evidence were prefaced with an executive summary or precis. Evidence becomes the property of the Committee, and may be printed. You may publicise your evidence between submission and publication, but in doing so you must indicate that it was prepared for the Committee.

On the basis of written evidence received the Committee will invite some witnesses to give oral evidence.

You may follow the progress of the enquiry from the Weekly Agenda of House of Lords Select Committees. This is free, and may be ordered from Miss Sue Hunt, Committee Office, House of Lords, London SW1A OPW, telephone 071 219 5791.

Further information from the Clerk, David Batt, House of Lords, London SW1A OPW, telephone 071 219 6075; direct line 071 219 3055; fax 071 219 6715.

22 November 1993

APPENDIX 4

Acronyms

ACOST	Advisory Council on Science and Technology
ARE	Admiralty Research Establishment
ARPA	Advanced Research Projects Agency
AWE	Atomic Weapons Establishment
BAe	British Aerospace
BNSC	British National Space Centre
BRITE	Basic Research in Industrial Technologies for Europe
CARAD	Civil Aircraft Research and Demonstration programme
CBDE	Chemical and Biological Defence Establishment
CBI	Confederation of British Industry
CDE	Concept development and evaluation
CERN	Controller of Establishments, Research and Nuclear
CSA	Chief Scientific Adviser
CSCE	Conference on Security and Co-operation in Europe
CST	Council for Science and Technology
DARPA	Defence Advanced Research Projects Agency
DCDS(S)	Deputy Chief of Defence Staff (Systems)
DCSA	Deputy Chief Scientific Adviser
DOAC	Defence Operational Analysis Centre
DOAE	Defence Operational Analysis Establishment
DoD	Department of Defense
DRA	Defence Research Agency
DTE	Defence Technology Enterprises
DTI	Department of Trade and Industry
DUS(DP)	Deputy Under Secretary (Defence Procurement)
DUTCs	Dual-Use Technology Centres
ESPRIT	European Strategic Programme for Research in Information Technology
EUCLID	European Co-operative Long Term Initiative in Defence
EURAM	European Research in Advanced Materials
FFRDCs	Federally-Funded Research and Development Centres
HC	House of Commons
IPMS	Institution of Professionals, Managers and Specialists
IPR	Intellectual Property Rights
ISL	Institut franco-allemand de Saint Louis
LCDs	Liquid Crystal Displays
MAST	Marine Science and Technology
MoD	Ministry of Defence
NATO	North Atlantic Treaty Organisation
NBC	Nuclear, Biological and Chemical
NMS	New Management Strategy
OA	Operational Analysis
OGDs	Other Government Departments
ONERA	Office National d'Etudes et Recherches Aéronautiques
OPSS	Office of Public Service and Science
OR	Operational Requirements
OST	Office of Science and Technology
PE	Procurement Executive
POST	Parliamentary Office of Science and Technology
RACE	Research in Advanced Communications in Europe
RAE	Royal Aerospace Establishment
RARDE	Royal Armament Research and Development Establishment
R&D	Research and Development
REs	Research Establishments
RSRE	Royal Signals and Radar Establishment
SCIENCE	Stimulation des co-operations internationales et des echanges necessaires aux chercheurs européens
SCRDE	Stores and Clothing Research and Development Establishment
SERC	Science and Engineering Research Council
TQM	Total Quality Management
VALUE	Exploitation and Utilisation of Research Results for Europe
WEU	Western European Union

APPENDIX 5

The DRA Framework Document

STATUS

- 1.1 The Defence Research Agency (DRA) which was established as a Next Steps Agency within Government on 1 April 1991, will operate as a Trading Fund from 1 April 1993. It remains in the ownership of the Secretary of State for Defence. It is required to operate on a commercial basis with predetermined performance targets and is financed by income earned from its customers.

AIMS AND FUNCTIONS

Aim

- 2.1 The DRA's aim is to provide independent high quality, efficient and cost-effective scientific and technical services to its customers, primarily to MoD.

Functions

- 2.2 The DRA will provide on agreed terms:

- a range of scientific and technical services to MoD in the areas of strategic research, applied research, operational assessments and studies, project support, the formulation of Staff Targets and Staff Requirements and Support to the Armed Services;
- scientific and technical services to Other Government Departments (OGDs);
- a technical and scientific service to meet the requirements of other public or private sector customers, where this supports the achievement of the first two objectives and is using capabilities required for defence and OGD purposes but not fully utilised.

- 2.3 In fulfilling its aim the DRA will:

- maintain and advance its technical competence and expert knowledge of research and technology developments worldwide to meet the needs of its customers;
- co-operate with industry in the United Kingdom to ensure that the DRA's output is exploited to the full, consistent with defence requirements;
- represent and maintain, within the policies and on behalf of HMG, relevant United Kingdom interests in international collaborative activities;
- create an environment which places the highest value on the motivation and development of individuals;
- operate in a manner that supports the Government's market testing and Citizen's Charter policies;
- comply with all relevant legislation, including that covering labour issues, in particular equal opportunities and health, safety and environmental matters and act in accordance with the Government's overall objectives in these areas.

RESPONSIBILITIES AND ACCOUNTABILITY*Ministerial Responsibility*

- 3.1 The Secretary of State for Defence is the responsible Minister for the DRA and is accountable to Parliament for the DRA's policy and operations. He determines the policy and financial framework within which the DRA operates and sets objectives and targets for it. The Secretary of State may designate another MoD Minister to assist him in the discharge of his responsibilities but neither Ministers nor officials of MoD will normally become involved in day-to-day operational matters.

Chief Executive

- 3.2 The Chief Executive is personally accountable to the Secretary of State for the efficient and effective management of the DRA, and for achieving the aim, objectives and targets set for the DRA in this Framework Document and in the Corporate and Business Plans, including the financial target set in the Treasury Minute laid before Parliament.

Accounting Officer Responsibilities

- 3.3 The Chief Executive is appointed by the Treasury as the Accounting Officer for the DRA Trading Fund. He is responsible for the DRA's accounts and financial procedures and for the proper, effective and efficient use of the DRA's resources within the terms of this Framework Document and of the memorandum setting out his responsibilities as Accounting Officer. He is liable to be summoned to appear before the Public Accounts Committee and will normally give evidence to Parliamentary Select Committees when the affairs of the DRA are being discussed. He is also responsible for ensuring that the requirements of Government Accounting are met, that the Agency observes any general guidance issued by Treasury, the Cabinet Office or OPSS and for putting into effect any recommendations accepted by Government of the Public Accounts Committee, Parliamentary Select Committee or other Parliamentary Authorities.
- 3.4 The Chief Executive is not accountable for the propriety and regularity of MoD customer requirements and expenditure proposals. These remain the responsibility respectively of the Permanent Under Secretary (PUS) as Principal Accounting Officer and permanent head of the Department and the Chief of Defence Procurement (CDP) as Additional Accounting Officer for Vote 3.
- 3.5 The Permanent Under Secretary, as Principal Accounting Officer, has overall responsibility for matters concerned with the management of voted funds across the Department and the allocation of resources. The Chief of Defence Procurement, as Additional Accounting Officer for Vote 3 from which any loans or grants to the DRA will be made, is responsible for the propriety and regularity of such loans or grants.

Other Government Departments

- 3.6 The Chief Executive will deal directly with Other Government Departments on questions related to the operation and management of the DRA, consulting Secretary of State on any aspect that is novel or contentious or could have wider policy implications for MoD.

Parliamentary Commissioner for Administration

- 3.7 The DRA is subject to the jurisdiction of the Parliamentary Commissioner for Administration.

Parliamentary Business

- 3.8 Members of Parliament will be encouraged to deal with the Chief Executive on matters delegated to the Agency under the Framework Document.
- 3.9 The Secretary of State will normally ask the Chief Executive to write to MPs who raise Parliamentary Questions about matters delegated to the Agency.

The Secretary of State will continue to deal in the usual way with other Parliamentary business, with enquiries about policy matters not delegated to the Agency and where a MP

specifically requests a Ministerial reply; seeking advice from the Chief Executive as necessary.

- 3.10 The DRA will respond to requests from Parliamentary Select Committees for information on matters delegated to the Agency under the Framework Document. The DRA's responses will be submitted to Ministers for prior approval.

FINANCIAL STRATEGY

Trading Fund

- 4.1 The DRA will operate as a Government Trading Fund in accordance with the Government Trading Funds Act 1973, as amended; and the DRA Trading Fund Order 1993.

Commencing Capital

- 4.2 The net assets of the trading fund at 1 April 1993 are financed by a combination of borrowing and public dividend capital.

Borrowing

- 4.3 The initial requirement for working capital is being met by borrowing. The DRA will, with the consent of the Secretary of State, be able to borrow from MoD votes such sums as it may require to meet its working capital needs and finance its capital expenditure programme, provided its indebtedness does not exceed the limit of £400 million contained in the DRA Trading Fund Order, and Temporary Borrowing and External Financing Limits agreed for individual years. The overall borrowing limit may be varied by an amending order, with the approval of Parliament.

Income and Expenditure

- 4.4 The DRA's revenue will come from payments made by customers for its services and from exploitation of its Intellectual Property. All sums received by the DRA will be paid into the Trading Fund and all expenditure incurred will be paid out of the Trading Fund.

- 4.5 The DRA will charge a rental to all MoD units and other bodies lodging on the DRA estate, and will also charge for utilities and other services supplied. All income from such leases and rentals and the sale of produce will accrue to the Trading Fund, except for such income covered by special collaborative arrangements.

- 4.6 The Chief Executive will manage the fund on behalf of the Secretary of State so that the revenue of the fund is not less than sufficient, taking one year with another, to meet outgoings which are properly chargeable to revenue account, and will aim to achieve such further financial objectives as the Secretary of State and Treasury may determine.

Pricing Policy

- 4.7 The DRA will aim to recover the full cost of carrying out customers' requirements and will price its activities generally in accordance with the Treasury's Fees and Charges Guide. In determining the cost of its activities, it will have regard to the financial objectives set by the Secretary of State with Treasury agreement. The DRA will comply with Government purchasing policies.

Application of Surpluses

- 4.8 As soon as possible after the end of the trading year, the DRA will calculate its net operating surplus after deduction of interest charges. This surplus will be retained in the business or appropriated to MoD votes or paid as dividends on Public Dividend Capital in proportions to be approved by the Secretary of State and Treasury Ministers. By agreement with the Secretary of State, sums which are retained in the business but are surplus to immediate requirements may be deposited with the National Loans Fund or in an interest-bearing account with the Paymaster General's Office or may be invested in Government Securities.

ORGANISATION AND ASSETS

Organisation

5.1 The Chief Executive will maintain an organisation that is:

- efficient and effective and is able to win and retain customers;
- responsive to changes in customer demand for defence research, technical advice and project support.

Assets

5.2 The DRA will retain, maintain and renew only the assets needed for its business and will dispose of surplus land, buildings, plant and equipment to achieve economy and efficiency in its operations. Any proposals to alter significantly the assets held by the DRA will be considered during the DRA Corporate and Business Planning processes. Most of the assets required by the DRA for its operations will be appropriated to it, but it may also lease assets in accordance with Treasury guidelines.

5.3 The estimated value of the assets appropriated to the DRA on 1 April 1993 is £197 million. Thereafter, the value of the assets held will be included in the Corporate and Business Plans and the Annual Accounts. Ownership of the assets appropriated to the DRA remains vested in the Secretary of State as owner of the DRA, but the Chief Executive will be free to manage them in such a way as to meet the aims and objectives placed upon him by the Secretary of State, provided that in so doing he conforms with the policy guidelines that apply to the defence estate.

Capital Investment

5.4 The DRA's capital investment requirements are determined by the Chief Executive. The five year capital commitment is set out in the Corporate Plan for approval by the Secretary of State.

Major new proposals not included in the Corporate Plan which exceed the Chief Executive's delegated powers are subject to consultation with the Secretary of State.

5.5 The DRA will carry out investment appraisals of all capital expenditure proposals in accordance with Treasury guidance.

Disposal of Assets

5.6 The distribution of net proceeds from disposals over £3 million will be decided by MoD and the DRA, with priority given to the repayment of any debt associated with the asset.

Intellectual Property

5.7 Intellectual Property Rights (IPR) generated in the DRA as a result of work paid for by the MoD remains vested in the Secretary of State and is administered in accordance with the IPR Concordat between MoD and the DRA dated 31 March 1992. IPR generated as a result of work funded by other customers will be subject to separate arrangements negotiated with the DRA.

DRA'S RELATIONSHIP WITH THE SECRETARY OF STATE

6.1 The Secretary of State for Defence is both the owner of the DRA and its principal customer. Within the MoD, staff supporting the Secretary of State in his role as owner of the DRA are separated from those concerned with the discharge of his responsibility as principal customer.

Defence Research Agency Council

- 6.2 The Defence Research Agency Council, chaired by the Minister of State for Defence Procurement and comprising senior MoD officials and Members drawn from industry and academia, assists the Secretary of State in carrying out his responsibilities as owner of the DRA. It considers the DRA's Corporate and Business Plans and advises him on the broad lines of DRA's strategic development, use of the DRA's assets and any potential conflict between his concerns as owner and as principal customer of the DRA.

MoD Focal Point

- 6.3 The Deputy Under Secretary (Defence Procurement) is the focal point within MoD for DRA matters. He will maintain a close working relationship with the Chief Executive DRA and will receive copies of all DRA submissions to MoD Ministers. In addition he:
- monitors the DRA's performance in meeting its objectives and targets and other requirements of the Framework Document;
 - ensures that matters affecting DRA policy are dealt with efficiently and effectively within MoD;
 - advises and assists the DRA Chief Executive on questions affecting the DRA's relationship with its owner.

He is assisted in this task by a small Secretariat Staff.

Special Requirements

- 6.4 Secretary of State may, exceptionally, direct the Chief Executive to undertake work or maintain capabilities incompatible with existing commitments or normal commercial practice. The DRA will suffer no financial detriment as a result of such a direction.

Other Obligations

- 6.5 The DRA will not develop or produce equipment for the MoD, other than laboratory prototypes, except when explicitly authorised to do so by the Secretary of State.
- 6.6 In entering into agreements with bodies other than MoD to provide research or technical support, the DRA will have regard to its obligations to provide an independent scientific and technical service to MoD and will not prejudice those obligations, even if this should be to its financial disadvantage.
- 6.7 Where the DRA gains access to intellectual property of a customer or collaborator, it will properly safeguard it. This specifically includes any obligations of confidence, express or implied, associated with evaluations of industrial proposals for development or supply of equipments and any information resulting from the test or evaluation of any proprietary equipment.
- 6.8 The DRA will ensure that DUS(DP) and his staff are kept informed of developments affecting the owner's interests or which are likely to involve Ministers.

International Collaboration

- 6.9 The DRA is MoD's main scientific and technical agent for international collaboration, with MoD oversight and policy guidance. The DRA is bound by HMG's policies and obligations in international and collaborative arrangements. MoD retains responsibility for all international collaborative arrangements in defence research, development and procurement which involve overseas Governments.

DRA's Relationship with MoD Customers

- 6.10 MoD and the DRA operate a formal customer-supplier relationship for all work placed on the DRA by MoD customers. A Terms of Business Agreement regulating business between MoD and the DRA has been signed which details the terms under which business between the MoD and DRA is conducted. The terms are similar to those used in MoD contracts with other suppliers but exclude conditions which already apply to the DRA as a Crown body, or which are inappropriate between two organisations where assets, whilst separate, are in common ownership. Although under English Law it is not possible for MoD and the DRA to enter into a legally binding relationship, the terms and conditions will be interpreted in accordance with the normal principles of English Law as though a contract existed.

Secretary of State, advised by the DRA Council, will be the final arbiter in disputes between MoD customers and the DRA which cannot be resolved under the disputes procedure in the Terms of Business Agreement.

Competition Policy

- 6.11 The DRA is expected to remain MoD's main source of scientific and technical advice but it will only conduct research work in-house where this is necessary to enable it to meet its objectives and provides value for money. A key objective during the DRA's first three years as a trading fund will be to introduce significantly more competition between the DRA and other suppliers for MoD work.
- 6.12 Where the MoD wishes the DRA to assume the role of Prime Contractor without competition, the MoD may require the DRA to run secondary competitions for elements of the work. DRA Business Sectors may participate in these secondary competitions and the DRA will be required to demonstrate that suitable arrangements are in place to enable fair and open competitions to be held.

Goods and Services Supplied by MoD

- 6.13 Where MoD supplies goods or support services to the DRA, the DRA will reimburse the MoD for the cost of these services on mutually agreed terms and conditions.

DRA'S RELATIONSHIP WITH OTHER CUSTOMERS

- 7.1 While its primary aim is to support MoD, the DRA may seek work on commercial terms from OGDs, other Governments and Industry within the framework of its Corporate and Business Plans as approved by the Secretary of State.
- 7.2 In undertaking work for other customers, the DRA will have regard to wider security and political considerations. In this context, the DRA's contacts or business with overseas Governments, firms or nationals will conform with MoD policy guidelines. The DRA shall obtain approval for the export of goods covered by the Export of Goods (Control) Order in accordance with specified procedures.

Co-operation with Industry

- 7.3 The DRA is encouraged to enter into collaborative arrangements with industry.
- 7.4 The DRA is also encouraged to develop agreements with industry to permit the transfer of technology for use for MoD purposes or other purposes, consistent with defence requirements.
- 7.5 The DRA will not through its actions prejudice the MoD's ability to place competitively work for research, development or production.

PLANNING AND PERFORMANCE REVIEW

8.1 The DRA will prepare each year, for consideration by the Secretary of State, a five year Corporate Plan and an annual Business Plan. These Plans when approved by the Secretary of State are the authority for the DRA to conduct its operations accordingly and provide a common understanding of the expected development of the business and a framework within which the DRA's performance can be measured.

Corporate Planning

8.2 The Corporate Plan will be rolled forward and updated each year. It includes:

- the DRA's main strategic objectives and means of meeting them;
- financial objectives and other principal performance targets;
- market testing proposals;
- assumptions about demand and other external factors influencing the DRA's trading activities;
- plans for the development of non-Exchequer work, and forecast receipts for Exchequer and non-Exchequer services;
- any major organisational or structural changes;
- proposals to rationalise the DRA estate, sell, lease and acquire land;
- proposed capital investment programmes;
- forecast consolidated operating statement, balance sheet and cash flow statement;
- major developments in management strategies, particularly as they relate to significant changes in the business.

Business Planning

8.3 The annual Business Plan is based on the assumptions in the Corporate Plan, but sets out the DRA's plans and budgetary targets for the financial year immediately ahead. It also sets out the key financial and other performance targets for that year. The Business Plan is the document against which the DRA's in-year performance is judged.

Planning Timetable

8.4 The Corporate Plan will be submitted to the Secretary of State in July, for approval in October, and the Business Plan by the following February, for approval by March each year.

Performance Indicators

8.5 Key performance targets are agreed for each year by Secretary of State and the Chief Executive as a fundamental element of the Business Plan. These targets assess the DRA's performance under the following headings:

Financial;

Efficiency Improvements;

Quality of Service.

The Secretary of State may also set targets to cover other aspects of the DRA's performance.

Performance Review

- 8.6 The Chief Executive will submit quarterly financial reports to the Secretary of State. Reports on the second and fourth quarters will include half-yearly and final accounts respectively, and will consider the DRA's performance in meeting its key targets. These two reports will be submitted for consideration by the DRA Council which will tender advice to Secretary of State. The Chief Executive will also report to the Treasury as required.

Trading Fund Reports and Accounts

- 8.7 The DRA will produce an annual report together with a statement of accounts, in accordance with Treasury directions, as required by Section 4(6) and 4(6A) of the Government Trading Funds Act 1973 as amended.
- 8.8 The annual report will set out the DRA's aims and activities, its performance against targets in the past year and its key targets for the year ahead. The accounts will meet the accounting and disclosure requirements of the Companies Acts and accounting standards, so far as these are applicable to the DRA.
- 8.9 The annual report and accounts will be published in accordance with Treasury directions and will be laid before Parliament before the summer recess.

Audit

- 8.10 The Chief Executive is responsible for the provision of internal audit, in a manner which best demonstrates value for money, in accordance with the standards of the Government Internal Audit Manual.
- 8.11 The DRA is subject to external audit by the Comptroller and Auditor General.

PAY AND PERSONNEL MATTERS

- 9.1 DRA staff are civil servants and will initially be covered by national Civil Service agreements on pay, grading and general conditions of service, although the DRA operates as a distinct employing body in the exercise of these agreements. Pay, grading and personnel authorities are vested in the Chief Executive who has overall responsibility for personnel management within the DRA.
- 9.2 The intention is that the DRA should develop its own pay and grading structure and be empowered to make other changes in Civil Service personnel policies appropriate to its circumstances. Where such proposals go beyond the Chief Executive's delegated powers they will require agreement with Treasury or OPSS as appropriate. There will be full consultations with staff and with accredited Trades Unions on any changes that affect terms and conditions of employment.
- 9.3 The DRA will develop and maintain a personnel management strategy which ensures that its pay and conditions and general policies enable it to recruit, develop and retain staff in the numbers and with the skills and expertise required to meet its aims and objectives.
- 9.4 Staff in the DRA are free to join accredited Trades Unions.

Appointment of Chief Executive

- 9.5 The Chief Executive will be appointed by the Secretary of State following open competition.

Interchange of Civilian Staff

- 9.6 There is a firm requirement for exchange of staff with MoD for career development and training purposes and to meet the business needs of both organisations. This is embodied in an interchange agreement between MoD and DRA which provides for annual negotiation of the numbers, grades and specialisms to be interchanged and the duration and terms of exchanges, and for an annual assessment of future needs taking account of the flow of staff between the DRA and MoD.
- 9.7 The DRA may also develop exchange agreements with OGDs and other private or public sector organisations in order to broaden individuals' experience and assist the DRA to meet its aims and objectives.

Service Personnel

- 9.8 Service personnel are, wherever feasible, provided to the DRA on repayment terms where the DRA considers military expertise is necessary to meet MoD requirements or to assist it to meet its aims and objectives. The numbers of Service personnel required by the DRA will be reviewed annually.

SECURITY AND SAFETY*Security*

- 10.1 The Chief Executive is responsible to the Secretary of State for meeting the security requirements specified by MoD.
- 10.2 The Chief Executive will consult MoD on any proposal to alter requirements for MoD Police to be deployed at DRA sites. MoD will retain ultimate responsibility for determining these requirements which will be reviewed periodically.

Health and Safety

- 10.3 The Chief Executive is responsible to the Secretary of State for ensuring that the provisions of the Health and Safety at Work Act 1974 are met. In order to ensure that safety standards are maintained to the required level, the DRA is subject to safety audit by the Secretary of State's Chief Safety Officer.

FRAMEWORK DOCUMENT*Review Arrangements*

- 11.1 This Framework Document will be reviewed jointly by the Secretary of State, the Chief Executive, the Treasury and OPSS after five years. Staff and accredited Trades Unions will be consulted about any changes which affect terms and conditions of employment.

APPENDIX 6

DRA Statistics

Where does DRA revenue come from?	
MoD Applied Research Programme	65%
Project support for MoD Procurement Executive	13%
Non-MoD	9%
MoD Strategic Research Programme	7%
Research and support for other MoD customers	7%

How does DRA account for each £1 of revenue received? (figures rounded up)	
Bought in research and materials for customers	37p
Staff and related costs not billed to customers	19p
Staff and related costs billed to customers	13p
Accommodation and depreciation	11p
Profit margin	5p
Other expenses	15p

What do DRA's 5000 qualified scientists and engineers specialise in?	
Computers and Information Processing	14.5%
Radio Frequency and Microwaves	11%
Systems Engineering	11%
Ballistics, Guidance and Propulsion	9.5%
Materials	9%
Energetic Materials	7%
Effectiveness Studies	6%
Acoustics	6%
Microelectronics and Electronic Materials	5.5%
Visible, Infra-Red and Ultra Violet	5.5%
Structures	4%
Electrical and Magnetic	4%
Hydrodynamics	2.5%
Human Sciences	2.5%
Aerodynamics	2%

(figures rounded to nearest ½ of 1 per cent)

Where are DRA staff located? (Figures rounded up)	
Farnborough Area	27%
Malvern	16%
Fort Halstead (Sevenoaks)	12%
Portsmouth Area	11%
Woolwich and Aquila	8%
Portland Area	7%
Bedford	6%
Chertsey	4%
Dunfermline	2%
Holton Heath (Poole)	2%
Christchurch	1%
Others	4%

APPENDIX 7

The concept of the 'customer' in MoD-DRA relations

As MoD describe in written evidence, under Trading Fund Status, which was granted to DRA in April 1993, "DRA is no longer funded directly on the MoD votes for its research programme but instead must recover the full cost of its operation from its customers — 90 per cent of which are individual budget holders in the Ministry of Defence." (p 1). This means in reality that MoD are to DRA no longer a single customer, but the collective body of hundreds of customers.

These customers range from the Deputy Chief Scientific Adviser (DCSA), who commissions MoD's strategic research budget (which provides 7 per cent of DRA's funding) to the many MoD staff who commission individual projects from DRA. These latter customers, whose budgets are overseen by the Deputy Chief of Defence Staff (Systems) are frequently service personnel who are placed for a limited time (typically 2 to 3 years) in the Procurement Executive, and they generally commission applied research and project support, which in 1992-93 accounted for 65 per cent and 13 per cent of DRA's income. They are coordinated by the "Fraser figure" (see paragraph 2.12), and typically their budgets range from tens of thousands to several million pounds per annum. Although they may remain at their posts in the PE for only a brief time, they are aided by permanent PE staff, and scientists seconded to the PE from DRA and elsewhere. Other non-PE project support and research makes up the remaining 7 per cent of DRA's income which it receives from MoD.

As MoD still owns DRA, MoD customers do not merely buy research and technical know-how from the Agency: they also assist the Ministry in deciding which capabilities and facilities to maintain at DRA. For example, MoD customers may decide that although they have little use at present for a particular facility, uncertainty as to the future need of the facility will require DRA to maintain that facility, even if DRA feel that there is little justification in keeping that facility open. In doing so, customers involve themselves in issues which, if DRA were more independent, would be the concern of DRA management only.

APPENDIX 8

Defence Research Abroad

It is notable that in certain countries, government-owned defence research establishments are given a specific remit to ensure that the money voted to them is spent in such a way as to benefit the wider science base and industry. Of particular interest here are the examples of France and the United States.

France

The French and British defence research systems differ in a number of respects which are relevant to the concerns of this report.

The French Ministry of Defence concentrates its technical expertise on armaments questions within the Délégation Générale pour l'Armement (DGA). The DGA can be thought of as roughly equivalent to the British Procurement Executive. However, its functions extend into those performed in the United Kingdom by the Chief Scientific Adviser and his staff, and into the work of translating the needs of the military staffs into technical requirements that, in the United Kingdom, is done by the DCDS (Systems).

The key staff within the DGA come from a specialist, permanent corps of armaments engineers, for which there is no British equivalent. These technical specialists have a greater say in determining the content of the defence research programme than in the United Kingdom case. Unlike in the United Kingdom, the DGA also has important powers to determine the structure of much of the French defence industry, the greater part of which is still state-owned.

France has no equivalent of the British DRA. Within the DGA, a division called the Direction des Recherches et Etudes Techniques (DRET) oversees the research programme, performance of which is distributed thus (pp 289-290):

- 63 per cent in industry;
- 7 per cent in universities and research centres of other ministries;
- 15 per cent in organisations under the supervision of the Ministry of Defence, but which also serve other bodies. These include the Office National d'Etudes et Recherches Aéronautiques (ONERA), and the Institut franco-allemand de Saint Louis (ISL);¹
- only 15 per cent in establishments which are fully within the MoD.

Even taking the last two categories together gives a figure for intramural research expenditure in France of only 30 per cent, compared with more than double that in the United Kingdom.² The consequent predominance of industry in the performance of defence research, together with the volume of contracts placed by DRET directly with firms (not via a body such as DRA) is one of the main differences between the two systems. It is seen in France as an advantage of this arrangement that the density of the networks between public and private laboratories involved in defence research is "a guarantee of the best use of dual-use technologies" (p 290).

More notable than this, however, is the explicit attention that has been given in France to the development of dual-use technologies. Thus, for several years there have existed large annual meetings to draw together defence and civil scientists (so-called *Entrétiens entre science et la*

¹ ONERA works with a number of civil agencies as well as with the DGA, and supplies industrial and commercial services as well as research. ISL is a joint Franco-German research institute dealing with ballistics and explosives related matters. [Source: DGA leaflet on DRET].

² UK Defence Statistics 1993, Table 1.5, gives as estimates for 1993-94: net intramural research £464 million; net extramural research £172 million; therefore, 73 per cent intramural.

défense). Civil agencies, such as the national space agency (CNES) are much more closely involved with defence programmes than would be the case in the United Kingdom.

The tone of the French outlook can be seen in the following quotation, taken from an editorial in the house journal of the French DGA, in introducing in 1991 a special issue on 'Les Technologies Duales':

Le temps n'est plus où les contraintes de secret et de spécificité conduisaient la Défense à mener des recherches isolément, en espérant, peut-être, des "retombées" civiles. Les conditions économiques et techniques d'aujourd'hui imposent de mener recherches et développements en pensant dualité: ce que je cherche n'existe-t-il pas ailleurs? ce que je trouverai ne sera-t-il pas utile ailleurs?¹

[The time is past when the constraints of secrecy or of specificity could lead to defence research being conducted in isolation, hoping perhaps for some civil spin-off. Today's economic and technological conditions require R&D to be conducted in a spirit of duality, asking: Does what I seek exist elsewhere? Can what I discover be used elsewhere?]

The willingness to place defence interests unashamedly in the forefront of wider national technological development is a theme that was continued, and much developed, in the November 1993 report of the Groupe de stratégie industrielle of the French Commissariat général du Plan.²

The report is a book-length document published by the French equivalent of HMSO. It was written by a group of over 60 (named) officials from the DGA and other ministries, industrialists, trade unionists, academics, and others. Among other things, it reasserts the importance of the defence sector to the French economy in general, and to French industry and technology more particularly,³ and calls for a policy of active development of dual-use technologies, with new government-industry consultative procedures to drive it. It reviews in some detail the future importance of a range of technologies, and calls for them to be divided between the three categories of those that it is critical to retain in France; those that could be maintained through European cooperation; and those that could be acquired from a broader range of suppliers.

Whether these recommendations are appropriate or not, the interesting point of comparison is between British concern to ensure that defence funds are sharply focused on defence purposes, and the French approach which, as in this case, not only ranges more widely but is also prepared to permit defence officials to associate themselves publicly with this position.

That this is characteristic of the French approach is confirmed in evidence given to this Committee by Professor Pompidou, who observes

"Our constant concern, like that of MoD and DRA, is to have regard ever more attentively to the osmosis between civil and military research. A continuous dialogue is maintained between the staff of the ministry of defence and those of civil ministries" (p 290); and

"This preoccupation with dual use technologies and with industry has been even more recently illustrated by the decision to create within the DGA a 'Delegation for the preparation of the future' whose role will be, among other things, to ensure that future choices reflect a judicious balance between the satisfaction of operational needs and the maintenance of a strong technological and industrial base" (p 290).

Nor, according to Pilkington Optronics, does this outlook necessarily weaken the quality of French defence research. Pilkington noted in evidence (p 289) DRET's "apparent duty and concern for French industry capability, which does not appear to blunt its capability to make companies compete for contracts and deliver good research".

¹ *L'Armement: Revue de la Délégation Générale pour l'Armement* (1991) Paris, No.29, October, p 3.

² Commissariat général du plan, *L'avenir des industries liées à la défense*, produced by the Groupe de stratégie industrielle. Paris: La Documentation Française, 1993.

³ Not uncontroversially. See F. Chesnais, 'Commissariat général du Plan: un rapport critique ... critiqué', *Damoclès*, No. 49, 1993, pp 30-31.

The point of this brief comparison is not, however, to argue that the French system is somehow better than the British, for the two are quite different in important respects. Rather, the point is to observe that French defence officials appear to be able to discuss problems of dual use technologies and the wider technology and industrial policy implications of expenditure on defence research, and for officials and ministers from other ministries to take up common cause with the defence ministry, in a way that seems to be less easy in the United Kingdom. In France there appears to be more of a sense of national effort in the husbanding of these resources than in the United Kingdom.

United States of America

Until recently, the main longer-term orientated American defence research institution was the Defense Advanced Projects Research Agency (DARPA). This is now known as the Advanced Research Projects Agency (ARPA), and although its main customer remains the Department of Defense (DoD), it now has a more explicit duty to enable American industry to compete with the rest of the world.

This new duty resulted from a DoD review, conducted in response to the dissolution of the Warsaw Pact, which identified four new dangers, one of which was the danger that America gave insufficient attention to the economic underpinnings of the industrial infrastructure on which their national security depends.² Part of the \$252 billion defense budget for 1994-95 is now dedicated to overcoming this danger, through, first, preserving selected production capabilities by continued production and maintenance, and secondly, by targeting funds at research and development rather than at procurement.³ But additional emphasis is being placed on relying more on the commercial technology and industrial base and the utilisation of dual use technologies.

In some areas where the US has a very advanced industry which supplies both civil and military customers, such as in many information technology areas, this reliance comes easily. But DoD now considers funding areas where the United States lags behind other countries such as Japan. To be eligible for funding, a technology area needs to have significant defense applications, and a reasonable chance of being competitive after the injection of funds which are unlikely to be forthcoming from private investors.

The most notable example of such a technology is flat panel displays, which have applications ranging from laptop computers to radar screens. The US does not currently have a competitive flat panel display industry, and most of the world's production facilities in this area are in Japan and, to a lesser extent, South Korea. In April this year, the American government announced a \$1 billion package to fund the development and manufacture of flat panel displays, the largest ever US government-funded programme for commercial technology. The goal of the present administration in providing these funds is to eventually supply one sixth of the world demand, establishing four large-scale manufacturing sites in the process.

In total, the 1994-95 budget has over \$2 billion allocated for the development of dual use technologies. Part of this money will be spent through the Technology Reinvestment Project which is run by ARPA, which provides funding and a process for developing new technologies, deploying technologies into new products, and manufacturing training, and which will support (among others) information infrastructure, electronics design and manufacture, and materials/structures manufacturing.

The emphasis upon dual use technologies has been strengthened by the reorganisation of the Office of the Secretary of Defense. Pursuing the notion that national security is based on a strong and competitive domestic economy and that DoD has an explicit interest in furthering the economic well-being of the country, a new office for economic security was created. This office's aim is to integrate DoD and civil interests to an extent not known before, and to sustain America's

¹ The analysis of American defence R&D priorities is based partly on a speech given to the Foundation for Science and Technology by Dr Richard van Atta, Special Assistant on Dual Use Technology Policy at the Office of the Assistant Secretary of Defense (Economic Security).

² The other identified dangers were the global proliferation of weapons of mass destruction; religious, ethnic and regional conflicts around the world; and the possibility of the failure of democratic reform in the former Warsaw Pact countries.

³ Where in 1985 \$3 was spent on procurement for every \$1 spent on R&D, in 1995, the ratio will be less than 2 to 1. This still represents a decrease in R&D funding, as in 1995, procurement spending will be less than \$50 billion, down by over \$70 billion since the late 1980s.

competitiveness in key dual use areas such as aerospace, electronics systems and packaging, shipbuilding, information networking, information displays, manufacturing, high performance computing, and materials.

In its efforts, DoD works closely with the Department of Commerce and other federal agencies.

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